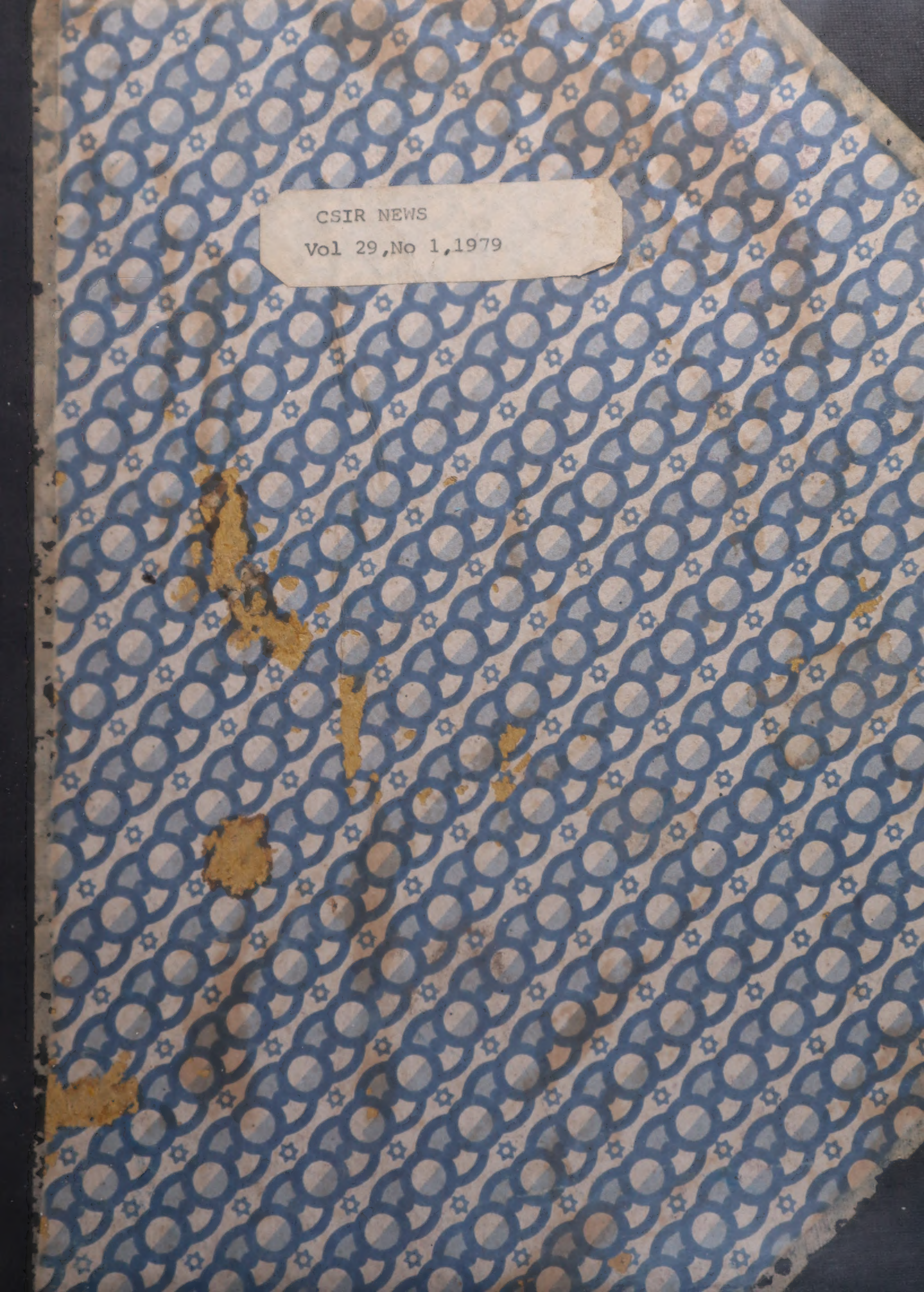




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Useful Microbes Found in Indian Copper Ores

Microbes responsible for leaching copper from their sulphide minerals (e.g. chalcopyrite, CuFeS_2) are present in all the Indian copper ores, including lean ores. This is one of the latest findings of the scientists of the Regional Research

Laboratory (RRL), Bhubaneswar, who worked on the recovery of copper, through bacterial leaching, from low-grade copper ores of Bihar, Karnataka, Madhya Pradesh, and Rajasthan. Most of the research work done in this laboratory and elsewhere in India consisted in the isolation and development of microbial flora from the mine waters and its inoculation into the leaching solutions. By providing inorganic nutrients and maintaining a suitable hydrogen ion concentration, the laboratory has established that the microorganisms are present in an apparently dormant state in the sulphide ore body itself. The laboratory has developed a technique by which these microorganisms can be activated within a few days to perform the dual functions of oxidizing ferrous iron and sulphide sulphur. Such an oxidation process enhances solubilization of copper from the ore. These dual-function autotrophic bacteria, known as *Thiobacillus ferrooxidans* and *Thiobacillus sulphoxidans*, are non-pathogenic, take oxygen from air for their growth (aerobic bacteria), and derive their nutritional requirements entirely from inorganic sources (for instance, even carbon is derived from carbon dioxide of the atmosphere). They can survive in an acidic environment and, during growth, produce sulphuric acid by oxidation of sulphide. This helps in leaching copper without additional sulphuric acid.

In copper-mining areas, huge quantities of lean material (0.1-0.5% copper) are available, but these cannot be utilized by the conventional methods. Bio-leaching to recover copper from such lean ores is an attractive technique.

Happy New Year

CSIR NEWS wishes its readers a happy new year.

It welcomes suggestions from readers for its improvement. While sending suggestions readers will please keep in mind that CSIR NEWS is a house bulletin of the Council of Scientific & Industrial Research.

This technique is employed in USA and other developed countries. These findings are expected to have immediate applications in India for recovering copper by dump- or heap-leaching. Microbial leaching techniques are pollution-free, their energy requirements are low, reactions take place at ambient temperatures, and capital investment would be rather low. Additionally, important non-ferrous metal copper from an otherwise virtually discarded material can be recovered.

Extensive work has been planned to increase the leaching rates and reduce acid consumption. The aim of the study is to understand the biogeochemical and bioextraction phenomena. The technique may have far-reaching applications also in the recovery of other metals (e.g. nickel, gold, etc.) from their low-grade ores and in removing small quantities of harmful impurities such as phosphorus from high-phosphorus manganese ores.

(Contd.)

NPL CORRECTS IST

The nation's standard time has been corrected by the National Physical Laboratory, New Delhi, and time has been retarded by 1 second on the midnight of 31 December 1978-1 January 1979.

Such a correction becomes essential because of the divergence between the astronomical time and the atomic time.

The astronomical time is based on the rotation of the earth on its axis. The rotation rate slows down owing to various celestial and terrestrial forces acting on the earth. The slowing down rate as compared to atomic time is three-thousandths of a second per day, or almost a second per year. As soon as the divergence becomes 0.9 second, a correction of one second is introduced in the required direction by advancing or retarding the atomic clocks at a pre-assigned time. The total difference between the astronomical time and atomic time is 18 seconds since 1959 when the atomic clocks were adopted internationally.

The correction, which is based on astronomical observations and on atomic clocks scattered all over the world, is computed and announced by the Bureau International de l'Heure, Paris.

Inside

BHATNAGAR PRIZE-WINNING WORK

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The researchers engaged in the project are Dr B.R. Sant and Dr M.M. Nandi.

Processes for Benzylamine and β -Phenylethylamine

The Central Electrochemical Research Institute (CECRI), Karaikudi, has developed two processes for the preparation of benzylamine and β -phenylethylamine by the electrolytic reduction of benzonitrile and benzyl cyanide respectively. Both these amines, each of which has an estimated demand of 30 tonnes/annum, find application as drug intermediates and corrosion inhibitors.

The advantages of the CECRI processes are: (i) it is easy to isolate the product in a highly pure state; (ii) the use of costly catalyst and high-pressure reactors, which are required in the conventional processes, is eliminated; and (iii) the cost of production is lower than that in the conventional process.

The raw materials required for the production of these compounds are available indigenously.

While the preparation of benzylamine was studied in a 75 A cell capable of producing 200 g of product per batch (8 hr), β -phenylethylamine was prepared in a 500 A cell on a scale of 2 kg of the product per batch (10 hr).

For a benzylamine plant of 100 kg/day capacity the total investment is estimated at Rs 16.6 lakh. The cost of production will be Rs 130/kg, which will lead to 35% return on investment. The total investment on a β -phenylethylamine plant of 100 kg/day capacity will be Rs 15.3 lakh and the cost of production, Rs 106/kg, giving 48% return on investment.

CGCRI Process for High Silica Glass Articles

The Central Glass & Ceramic Research Institute (CGCRI), Calcutta, has developed a process for the production of

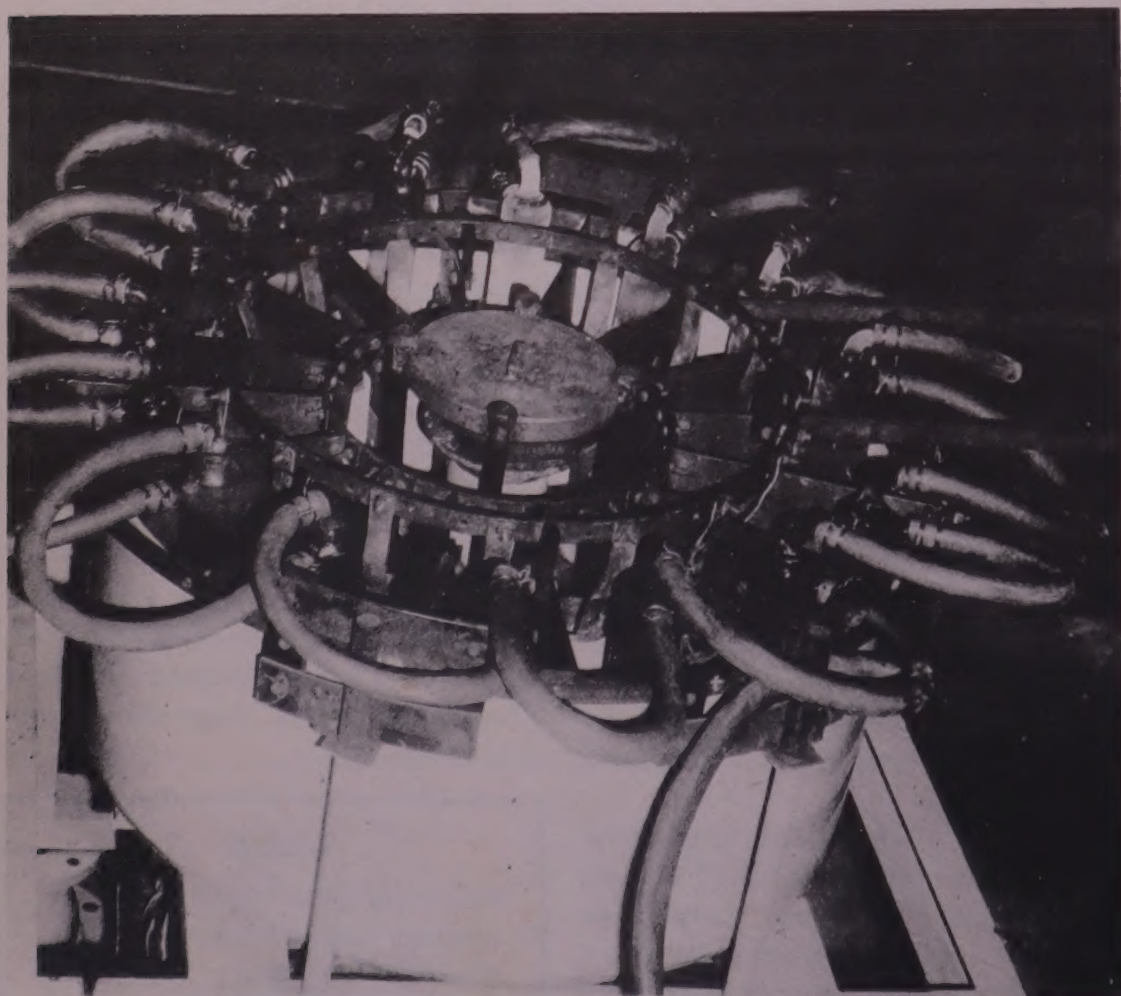
high silica (> 96%) glass articles. The glass is composed of silica and fluxes. Articles such as tubes, rods and slabs can be fabricated from the glass.

By a series of operations requiring stringent control of experimental conditions, the fluxing ingredients are selectively leached out, leaving a porous 96% silica glass. This is subsequently sintered to obtain the required article with a compact mass. The glass is colourless and transparent, and has a high thermal shock resistance. Articles made of this glass when heated to 1200°C and quenched in water do not crack. The characteristics of the glass are: thermal expansion, $7.2 \times 10^{-7}/^{\circ}\text{C}$; and softening temperature, 1500°C. The slabs may find use in the transmission of UV radiation. The process can be adopted on a small scale.

Appropriate Industrial Technology: Exhibition

The Publications and Information Directorate (PID), New Delhi, organized an exhibition on books and literature and models which reflected the theme of a forum on appropriate technology held at Vigyan Bhawan, New Delhi, from 20 to 25 November 1978. This UNIDO-sponsored international forum was organized by the Government of India through its Department of Industrial Development. The forum dealt with appropriate technologies globally in respect of twelve major sectors of industry, viz. (1) Basic industries such as steel, metal transformation, including capital goods, fertilizers, and chemicals and the like; (2) Drugs and pharmaceuticals; (3) Textiles; (4) Sugar; (5) Cement and building materials; (6) Food storage and processing; (7) Agricultural machinery and implements; (8) Light engineering and rural workshops; (9) Oils and fats; (10) Paper products and small pulp mills; (11) Energy for rural requirements; and (12) Low-cost transport for rural areas.

The delegates to the forum showed keen interest in the exhibits, which



Cell used for producing benzylamine and β -phenylethylamine: CECRI, Karaikudi



Sections of the PID exhibition organized during the International Forum on Appropriate Industrial Technology (Vigyan Bhawan, 20-25 November 1978) showing books, charts and building materials

ranged from books on biogas to samples of low-cost housing materials, and appreciated the work being carried out in India. Twenty-two organizations, both public sector and private, concerned, among other things, with appropriate technology, participated in the exhibition. PID's publications having a bearing on the theme of the forum were also displayed. Among the participants, the Central Building Research Institute, Roorkee, and the National Buildings Organization, New Delhi, displayed, through models and charts, their technologies relating to building materials and related areas.

The exhibition was organized by the PID's Planning & Research Cell.



NRDC-CSIR Processes 1976-77

Out of the 97 processes referred to the National Research Development Corporation of India (NRDC), New Delhi, by various organizations, during 1976-77, 56 processes were the results of the work of CSIR laboratories. The contribution from the Central Electrochemical Research Institute (CECRI), Karaikudi, was maximum with 11 processes, the next in the list being the Central Leather Research

Institute (CLRI), Madras, with 8 processes. These statistics are revealed by the annual report of NRDC for the year 1976-77. The report further shows that of the 166 licences negotiated by NRDC for commercialization of processes during the year, 148 licences related to CSIR processes. These include processes from the Central Building Research Institute, Roorkee (14 licences); the Indian Institute of

Petroleum, Dehra Dun; the Central Fuel Research Institute, Dhanbad; and the Central Road Research Institute, New Delhi (the last three accounting for one licence each)—laboratories which have now been assigned to the user ministries/departments.

The CLRI know-how on manufacture of Syntan PKR was assigned to Pilar River Plate of USA through an agreement with NRDC. Another of CSIR's know-how, viz. RRL-Hyderabad's process for the manufacture of monochloroacetic acid and

benzyl group of chemicals, was assigned to Rohr Ltd of UK through an agreement.

During the year, NRDC's earnings through premia and royalty amounted to Rs 16.5 lakh and Rs 51.5 lakh respectively. Of these, CSIR's shares

were Rs 15.5 lakh and Rs 50.5 lakh respectively. Here also CECRI's contribution was maximum (Rs 14.3 lakh). The Central Mechanical Engineering Research Institute, Durgapur, comes next with its processes earning premia/royalty of Rs 13.3 lakh.

COMPUTER SCIENCE RESEARCH

BHATNAGAR PRIZE-WINNER PROF. RAJARAMAN'S WORK *

Prof. V. Rajaraman has made pioneering contributions in teaching and research in computer science in India and has generated a computer consciousness in the country. At the Indian Institute of Technology (IIT), Kanpur, he has organized and nurtured an excellent computing facility, recognized as one of the best in the country.

The first post-graduate school in computer science was started at IIT-Kanpur under Prof. Rajaraman's leadership. Right from the inception of the computer science educational programme at IIT, Rajaraman was convinced of the need to educate students in diverse areas of computer science so that the students could in turn develop these areas. He and his students have worked in computer software, computer hardware and architecture, and real-time control application of computers. His group has done pioneering work on decision tables—a tool used in computer systems analysis and design. This work was widely acclaimed by industry.

Rajaraman was on a number of consultancy assignments to industry. While he was a consultant to NELCO in 1970 the first Indian electronic desk calculator was developed. Since 1971 he is a consultant with the Tata Consultancy Services, Bombay, which has pioneered in software export. In 1974 he was a consultant to Electronics

Corporation of India Ltd, Hyderabad, and held wide-ranging discussions on the development of software systems for TDC computers and on design automation. Currently, he is a consultant to Hindustan Steel Ltd on the real-time computer control of a billet mill at Bhilai Steel Plant. Under his guidance was developed a computer control system using a TDC-312 computer; this is being installed at Bhilai. This is a significant venture in which an Indian computer is being installed for process control for the first time in a steel plant. The control algorithm and system software were developed by a team under his guidance.

Some of the projects completed under Rajaraman's supervision have been taken up for commercial exploitation. EDUCOM-8, an educational digital computer to teach the basics of computer organization and computer maintenance, is being marketed by Professional Electronics Products, a small-scale industry. The electronic taximeter developed by his students has been taken up by the National Research Development Corporation of India for commercial exploitation.

As the Computer Centre at IIT-Kanpur was one of the first to be set up in India, the need for spreading computer education to research workers in universities and laboratories and to professionals in industry was recognized as an important goal of the centre. Rajaraman has coordinated and lectured in 15 special short-term intensive courses on computers between 1970 and 1975. He has organized courses on basic programming and numerical methods, use of decision tables in systems design, computer methods in operations re-

search, evolutionary operation of chemical plants, computer logic design, and real-time computers. Based on his teaching in these intensive courses and in regular courses at IIT-Kanpur, he has written several textbooks on computer programming, computer-oriented numerical methods, analogue computation and simulation, and digital computer design.

Prof. Rajaraman (born 8 Sep. 1933) obtained B.Sc. (Hons) (1952) from the Delhi University; a diploma in electrical communication engineering (1955) from the Indian Institute of Science, Bangalore; S.M. (1959) from Massachusetts Institute of Technology, USA; and Ph.D. in electrical engineering (1961) from the University of Wisconsin, USA. During 1961-62, he was Assistant Professor of Statistics at the University of Wisconsin. He joined as Assistant Professor, Electrical Engineering Department and Computer Centre at IIT-Kanpur in 1963 and rose to the positions of Associate Professor in 1966 and Professor in 1968. He became Senior Professor in 1972. Rajaraman was a Visiting Assistant Professor in the University of California, USA, during 1965-66, and a Visiting Fellow in the IBM Systems Development Institute, Canberra, Australia (1972-73).

Prof. Rajaraman's contributions are widely recognized. He has given, on invitation, a number of talks on his field of specialization at home and abroad. He is member of several committees: member, executive council of Computer Society of India (1968-71, and 1973-75); member, editorial board, *Journal of the Computer Society of India* (1970-72); vice chairman, programme committee, Jerusalem Conference of Information Technology, Israel (1971); member, programme committee, Rio Symposium on Computer Education for Developing Countries (sponsored by Brazilian Academy of Science, and UN), Rio de Janeiro (1972); member, programme committee, Second World Congress on Computer Education (sponsored by the International Federation of Information Processing Societies),

*Prof. V. Rajaraman, Professor of Electrical Engineering and Computer Science Programme, and head, Computer Centre, Indian Institute of Technology, Kanpur, has been chosen (jointly with Prof. Rajinder Kumar) for the Shanti Swarup Bhatnagar Prize in engineering sciences for the year 1976 [CSIR NEWS, 28(1978), 113].

Marseilles, France (1975); member, programme committee, National Systems Conference (1974); and member, planning group, Computer Society

of India (since 1974). He is also member/chairman of a number of government committees.

FLUID-FLUID DISPERSION, MULTIPHASE REACTIONS AND ANALYSIS OF MULTIPHASE REACTORS

BHATNAGAR PRIZE-WINNER PROF. KUMAR'S WORK *

Prof. Rajinder Kumar has contributed significantly to the understanding and analysis of multiphase systems. His specific contributions are in the areas of fluid-fluid dispersion, multiphase reactions and analysis of multiphase reactors.

Kumar generated, for the first time, a unified model to explain the formation of bubbles and drops at single nozzles submerged in stagnant pools of liquid. He considered the two phenomena as a single problem of fluid dispersion in liquids. The model, which considers the fluid particle formation to take place through expansion and detachment stages, describes both the phenomena through a single set of equations. It not only predicts the influence of different variables quantitatively, but also completely explains why contradictory conclusions were arrived at by earlier investigators. This unified model has been widely tested for both bubble and drop formation in many divergent systems like industrially relevant non-Newtonian fluids and fluidized beds.

In order to predict the dispersed particle size at industrially relevant distributors like sieve plates and sintered discs, Kumar has worked out techniques which enable the use of the two-stage model for these complex situations. For dispersion through sieve plates, he has developed a model which takes into account the growth, drainage and rupture of thin films. His new model, which combines the two-stage model

with geometric considerations, leads to equations that predict bubble sizes generated at sintered discs. The first of their kind, these models have been extended to non-Newtonian fluids as also reacting systems.

Kumar's pioneering attempt has led to a working model for predicting average bubble size generated in the impeller region of a stirred vessel used for gas-liquid contacting. The model considers the generation of gas jets at varying positions of the impeller and their subsequent disintegration.

Against the empirical methods used earlier for predicting droplet sizes, and that too for low-viscosity liquids, in pneumatic atomizers, Kumar has developed a model based on force balance for liquid disintegration, which predicts average particle sizes generated by these atomizers under widely varying conditions. The model is useful to mechanical engineers also.

Kumar has employed the equations governing the bubble formation model proposed by him for variable flow rate to nucleate boiling from single sites. The flow rate into the bubble has been evaluated by considering the shape of the bubble, and the heat transported through the microlayer and from around the rest of the bubble. This has demonstrated the versatility of his dispersion models.

The complex, but industrially important, phenomenon of leaching a solid from a matrix of inert material by using a reactive solvent has been analyzed by Kumar with reasonable success. The model considers the solid structure and time-dependent pore size generation and the resultant transport rate. It is

expected that more robust models based on this basic effort will follow. A similar, but more comprehensive, structural model has also been developed for gas-solid reactions where the sensitivity of the model to various assumptions has been tested.

An important new reactor, known as foam-bed reactor, which has become popular as a pollution-control device and was investigated by many workers, lacked analysis and understanding. The system is complex as the bubbles generated at a shallow pool of liquid distort in foam, forming films which drain down through boundaries called plateau borders. Kumar has developed a mathematical model taking into account the bubble size, voidage, drainage, etc. The model is capable of predicting the performance of this equipment both as a reactor and a gas-cleaning device.

Another of Kumar's important contributions has been to suggest the only available analysis of what has been termed as the filter-bag reactor. Used for pollution control, this reactor involves the injection of a reactive solid powder in the gas duct containing a gaseous pollutant. The reaction takes place and the partially reacted solid collects at the bag, forming a cyclic reactor. The thickness of the partially reacted solid layer is time-dependent. The model offers a simple method to size reactors of this kind.

Industrial Projects

Kumar has been engaged in a variety of industrial projects which involve technology development, design and technical advice.

One of Kumar's most challenging projects has been the development of a technology for the manufacture of copper sulphate directly from chalcopyrites concentrates. The process has now been scaled up to industrial size. The technology consists in controlled oxidation of CuFeS_2 to obtain CuSO_4 , CuO and Fe_2O_3 . The copper content is then leached with dilute H_2SO_4 ; iron, being insoluble, remains as residue. The leached solution is evaporated and

*Prof. Rajinder Kumar of the Indian Institute of Science, Bangalore, has been chosen (jointly with Prof. V. Rajaraman) for the Shanti Swarup Bhatnagar Prize in engineering sciences for the year 1976 [CSIR NEWS, 28(1978), 113].

crystallized. The gas-cleaning section is required to remove the dust and SO_2 . A method has also been developed to remove iron as $\text{Fe}(\text{OH})_3$ if some amount of it gets leached.

The fluidized bed proved to be the only solution which could offer the desired degree of temperature uniformity and adequate contacting. For the full-scale plant, a fluidized bed of 75 ft^2 distributor area was designed and operated. This is not only the largest indigenously designed fluidized bed, but it handles flotation material which is very hard to fluidize. The plant, now in operation, is the only one of its kind in the country.

Kumar's other projects relate to: (i) pilot plant work on ammonia stripping from an effluent stream and design of a large-scale stripper; (ii) design of a unit for producing molybdenum oxide by fluidized-bed roasting of molybdenum sulphide; (iii) development of know-how for *m*-nitroaniline; (iv) design of a unit for hydroxycitronellal; and (v) development of know-how for benzaldehyde manufacture. Kumar has rendered technical advice to a number of small-scale manufacturing units.

Kumar's research has, for the first time, generated analytical predictive methods for many multiphase situations where only empirical methods were available earlier. It has also resulted in a unified approach to various apparently divergent areas. His research on the foam bed and filter bag reactors has generated expertise for solving some environmental pollution problems.

Prof. Kumar (born 9 Sep. 1934) did his B.Sc. (Hons) (1954), M.Sc. (Tech.) (1955) and Ph.D. (1965) from the Panjab University. Joining the Indian Institute of Science, Bangalore, in 1962 as a senior research assistant, he rose to the positions of Lecturer (1963) and Assistant Professor (1967). He became Professor in chemical engineering in 1970. He has, co-authored, on invitation, a chapter on 'Bubble and drop formation' in 'Advances in Chemical Engineering' (Vol. VIII, Academic Press,

New York, 1970). His work on drops has been quoted in Perry's Handbook for Chemical Engineers.

Kumar has published about 70

research papers and seven review papers. Fifteen students have obtained Ph.D. degrees under his guidance.

CYTOCHEMISTRY AND ULTRASTRUCTURE OF PROTOZOA

BHATNAGAR PRIZE-WINNER DR DUTTA'S WORK *

Dr G.P. Dutta has made significant contributions to protozoology by providing a new concept on the structure and function of cytoplasmic inclusions of protozoa. His findings, put forward in 1961 at the first International Conference on Protozoology (Prague), on the role of Golgi complex and other cytoplasmic inclusions have been substantiated by leading electron microscopists.

Dutta has developed, for the first time, a method for initiating axenic culture of *Entamoeba histolytica* from its locally isolated strains (STA) growing with mixed bacterial flora without the association of Trypanosomatids or without adding agar in the medium. The bacterial flora was eliminated from amoeba cultures by treating the cultures with gentian violet, acriflavine, and a suitable mixture of antibiotics which are not lethal to the amoebae. Dutta has analyzed another strain of *E. histolytica* (EHB) by this method. Carrying out a detailed study on the role of strongly negative O-R potential in axenic cultivation of *E. histolytica*, Dutta and his group have shown that incorporation of 0.2% L-cysteine hydrochloride in the TPS-1 axenic medium (without the use of 0.02% ascorbic acid) and substitution of 10% buffalo serum for horse serum, provide strongly negative O-R potential in the axenic medium. This is absolutely necessary for getting high yields of amoeba. His group has shown that strongly negative O-R potential is

necessary to cut down the lag phase when a small number of amoebae is inoculated, but the maximum population reached is the same with both large and small inocula of amoebae. His study has opened up a new line for large-scale cultivation of *E. histolytica* for immunodiagnosis and immunoprophylaxis against amoebiasis. The modified TPS-1 medium developed at the Central Drug Research Institute (CDRI), Lucknow, by Dutta and his group has been thoroughly tested after storage up to 3 weeks at 4°C and has been found to support the growth of amoebae. Dutta has also shown that horse serum, which is rarely available, can be replaced by the easily available buffalo serum for large-scale axenic cultivation of *E. histolytica*.

Dutta's study has revealed that while the absence of trypticase in the axenic medium suppresses the amoebic growth by nearly 50%, absence of vitamin mixture suppresses it by 70%. On the other hand, a good growth is seen in the pH range 5.5-7.5, the best growth being at pH 7.2.

Dutta has developed some methods for accurately determining the anti-amoebic potentials of all the known drugs by developing suitable testing procedures for the anti-amoebic activities against the axenic *E. histolytica*. These methods are being used by CDRI for large-scale screening of potential amoebicides. The prize-winner has shown that, contrary to the general belief, there is no synergistic or additive effect of using a number of antibiotics combinations. His studies have provided a rationale for the treatment of clinical amoebiasis. His methods of testing the potentials of the anti-amoebic

*Dr G.P. Dutta of the Central Drug Research Institute, Lucknow, has been chosen (jointly with Dr Kishan Singh) for the Shanti Swarup Bhatnagar Prize in biological sciences for the year 1976 [CSIR NEWS, 28(1978), 113].

compounds are expected to provide a basis for accurate assessment of structure-activity relationship of new, biologically active molecules.

Working on the problem of tackling cysts in chronic amoebiasis Dutta's group has found that: (1) emetine, used at alkaline pH (7.6), shows cysticidal action; (2) when the permeability of the cyst wall is changed by treating with non-lethal concentrations of sodium lauryl sulphate, the treated cyst can be readily killed by drugs like emetine; and (3) in addition to live bacteria and their aqueous extract, fungal extracts and mixtures of L- and D-amino acids promote excystment. With all the excystment agents employed (e.g. aqueous extract of *Esch. coli*, mixture of D- or L-amino acids, trypsin and live *Esch. coli*), Dutta has found that the inhibitors of protein synthesis (cycloheximide) and oxidative phosphorylation (dinitrophenol and sodium arsenite), prevent both the activation of cyst and emergence of amoeba, whereas inhibitors of DNA synthesis (mitomycin C and hydroxyurea) and messenger RNA (actinomycin D) have practically no effect on excystation of amoebae. Pre-activation of the cysts by trypsin leads to their normal excystment in the presence of mitomycin C, hydroxyurea and actinomycin D, a finding which suggests the existence of a suitable m-RNA in the cyst.

Dutta has developed a method for producing hepatic amoebiasis in hamsters by intraperitoneal inoculation of trophozoites of *E. histolytica*. This method is quick and has the advantage that no laparotomy is required, thus eliminating the chance of secondary infection in the peritoneal cavity. The development of a suitable laboratory model for testing the activity of new compounds forms the basis of finding new drugs for hepatic amoebiasis. More than 50 potential compounds have been tested so far by Dutta and his group.

Dr Dutta (born 19 Nov. 1933) did his B.Sc. (Hons) (1955), M.Sc. (Hons) (1956), Ph.D. (1960) and D.Sc. (1973) from the

Panjab University. He was a lecturer in that university (1963-64) before he joined CDRI as Scientist B in 1964. He became Scientist C at CDRI in 1969.

Dutta has published a number of reviews on cytochemistry and related areas, and more than 60 research papers.

Deputation Briefs

Dr P.K. Gupta of the Industrial Toxicology Research Centre, Lucknow, was deputed as a Visiting Scientist to the University of Tennessee Centre for Health Sciences, and the West Virginia University Medical Centre, Morgantown, USA. Dr Gupta was in USA from March 1977 to September 1978.

During his stay at these universities, which was on invitation from them, Dr Gupta delivered several lectures and seminars covering broad areas of toxicology to graduate students. His research interests at the American universities included safety evaluation of cyclohexanone, a plastic solvent of industrial importance; comparative toxicity of diethylhexyl phthalate (DEHP) and butylbenzyl phthalate; carcinogenic potential of polyurethane disks used as surgical implants; inhalation toxicology of several synthetic compounds used for the manufacture of spacecraft materials; and fetal toxicity and teratogenicity of monoethylhexyl phthalate, a toxic metabolite of DEHP.

Dr Gupta was also invited as a Visiting Professor at the Mississippi Industrial College, Hollysprings, Mississippi, and to deliver a seminar lecture at the Food and Drug Administration, Washington DC.

In recognition of his work in toxicology, Dr Gupta was elected a fellow of the American College of Veterinary Toxicologists, and a member of the Society of Toxicology, USA.

Dr Gupta chaired a session on toxicology and on invitation gave a talk at the first joint meeting of the American Society of Pharmacology and Experimental Therapeutics and the

Society of Toxicology, held at Horston, Texas (17-23 August 1978). Besides, he participated in and presented papers at several other meetings such as First International Congress on Toxicology, held at Toronto, Canada; annual meeting of ASPET, held at Columbus, Ohio; Tools to Predict Safety Evaluation of Chemicals, held at Little Rock, Arkansas; Continuing Education and Training in Toxicology, held at Memphis; and conference on Grants and Funding, held at Morgantown.

At present Dr Gupta is editing three volumes on toxicology of 'Modern Toxicology' to be published by Hemisphere Publishing Corporation of USA.

PROGRESS REPORTS CECRI Annual Report: 1977- 78

The annual report of the Central Electrochemical Research Institute (CECRI), Karaikudi, for 1977-78, published recently, shows that the institute had 104 R&D projects in hand in the following areas: Batteries; Corrosion; Electrometallurgy and electrothermics; Electro-organic and electro-inorganic products; Electroplating, electrodeposition and metal finishing; Electrode kinetics, electrochemical equilibria and electroanalysis; Solid state electrochemistry; and Instrumentation. Fourteen processes were released to licensees through the National Research Development Corporation of India (NRDC). Three processes were completed and assigned to NRDC for commercialization. The laboratory has been engaged as consultant by NRDC for setting up a 380 kVA arc furnace for the production of calcium carbide at Rangoon, Burma.

An electrolytic process for the production of glyoxalic acid from oxalic acid has been developed. In this process the product can be isolated in pure form. Glyoxalic acid is used in the synthesis of vanillin and vitamin C derivatives. The estimated demand for glyoxalic acid is 50-100 tonnes per annum. All the raw

materials and equipment required for manufacturing the product are indigenously available.

A high-speed continuous process has been developed for forming high-grained etched aluminium foil. These foils are incorporated in low-voltage aluminium electrolytic capacitors used in transistors.

In order to make luminescent transfer paper a process has been developed which consists in coating a sheet of paper with a waxy composition containing a luminescent substance. The impressions from this paper are visible in ultraviolet light and are invisible in ordinary light, and the paper is therefore a convenient device for preparing documents of a confidential nature.

At the instance of Shri Venkateswara Chemicals, Karur, a process for the isolation of iso-borneol from iso-borneol acetate was worked out.

To convert iodate to periodate, a 1000-A cell was run at the Madras unit and the personnel from Bush Boake Allen (P) Ltd were trained for running the 1000-A cell.

Sethia Metals & Alloys Pvt. Ltd, Udaipur, were facing difficulties arising from a higher percentage of chloride contamination in the raw materials and increased anode corrosion, which in turn were due to a high chloride content in their plant for the production of zinc from galvanizer's ash. CECRI assisted the firm in streamlining the production and standardized the conditions.

In electro-organic and electro-inorganic products, studies were made on the production of *p*-aminophenol, hydrazobenzene and benzidine from nitrobenzene; β -phenylethylamine from benzyl nitrile; *p*-aminobenzoic acid from *p*-nitrobenzoic acid; cyclohexylamine from cyclohexanone oxime; 2,6-dimethylaniline from *m*-nitroxyline; sodium iodate from iodine and caustic soda; and sodium peroxide from sodium metal. Aminoguanidine bicarbonate was prepared by reducing picrite received from the Defence. The product (30 kg) has been dispatched to High Explosives Factory, Kirkee.

A 500 A cell has been designed, fabricated and set up for the electrolytic production of cuprous oxide. The cell has been operated with both commercial-grade and electrolytic-grade copper anodes. A product containing 96% cuprous oxide (85-86% copper content) was obtained.

The three cells, each of 10,000 A capacity, of the laboratory's pilot plant, were run in series continuously. Twelve tonnes of magnesium metal were produced. The technique of re-starting the cells in the event of unforeseen power shutdowns has been worked out. This technique is likely to be useful in large-scale operations.

The process on titanium substrate insoluble anodes received a cash award of Rs 2000 from NRDC.

Sixty-one research papers were published and 18 patents filed during the year.

A Report on CSIR-Polytechnology Clinic, Ahmedabad

The CSIR-Polytechnology Clinic*, Ahmedabad, has brought out a report on the various services rendered by this centre to the industries during October 1977-March 1978. The clinic started functioning in 1977 with a view to bridging the communication gap between the research institutions and industrial units in the region. The problems identified so far by the clinic relate, among others, to Rajkot foundry industries, setting up of mini cement plants, binder for lignite cakes, jari industry, cashew cultivation, medicinal and aromatic plants, and brass foundry industries. In all, the clinic identified 165 problems, of which 127 were solved and 33 were under investigation.

Further details on the activities of the clinic can be had from: The Project Officer, CSIR Polytechnology Transfer Centre, Gujarat University Building, Ahmedabad 380009.

*Polytechnology clinics are now designated as Polytechnology Transfer Centres.

PATENTS ACCEPTED Indian Pat. 590/Cal/75

Improvements in or relating to the process for the surface preparation of mandrels with nickel-tin electrodeposit for electroforming articles

B.A. SHENOI & S. JOHN

Central Electrochemical Research Institute
Karaikudi

This patent relates to the process for the electroforming of metal articles. The principal object of the process is to facilitate stripping of such articles from the mandrel on which they are formed. Hitherto, lead, stainless steel, titanium and mandrels plated with chromium, rhenium and silver were used as mandrels in the production of sheet copper and other articles by the electroforming process. But the commercial application of these mandrel materials depends on variables other than the electrodeposition process environment. The drawbacks of this mandrel are that it fails to give: (i) pore-free foil, (ii) shining mandrel surface, and (iii) reproducibility (of obtaining copper foils of similar characteristics).

This process is based on the observation that when a suitable mandrel is coated with a layer of nickel-tin alloy deposit prior to electroforming and when such a mandrel is used as a cathode in the electroforming bath, the electrodeposited metal is stripped with great ease from the mandrel without injury to either the mandrel or the electroformed article. The main advantages of the process are: (1) the electroformed copper foils are pore-free; (2) the side facing the mandrel is lustrous, smooth and shiny; (3) it is easy to peel off the foil; (4) reproducibility (of obtaining copper foils of similar surface finish) is achieved; (5) the foils are wrinkle-free; and (6) the chemicals used are indigenously available and cheap.

PATENTS SEALED

2504/Cal/74 (144304): An improved header die for making sintered glass headers, N.C. Gupta & S. Chander—CEERI, Pilani.

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Transfer of Technology to Rural Sectors

CSIR get-together sorts out *modus operandi*

There cannot be a second opinion about the need for an interaction of science and technology with rural crafts for speedy development of rural industries and a change in rural health and sanitation. The reason behind this need was thoroughly analyzed and certain significant technologies were identified for transfer to rural areas at a get-together held at Wardha on 30 December 1978 among scientists hailing from various national laboratories and social workers.

The get-together was a follow-up of the workshop on 'Gaon ke Karigar aur Science' (Village Artisans and Science) organized on this topic by the Management Development Unit of the Planning Division of CSIR in collaboration with the Centre of Science for Villages (CSV), Wardha, in September 1978 [CSIR NEWS, 28 (1978), 145].

The Prime Minister, Shri Morarji Desai, who is also the President of the Council of Scientific & Industrial Research, attended the get-together, and expressed his happiness on the scientists' having undertaken the responsibility for regenerating the rural industries with the help of science and technology and making an effort to better rural health and environment. He was glad that scientists and social workers had put in their heads together for the regeneration of rural lives.

Shri Desai appreciated the role of the CSIR scientists in taking a lead to bring the fruits of science and technology to the doorsteps of the common people. He hoped that the dialogue between the R&D organizations and the voluntary associations would grow further, resulting in greater service to the rural people.

Prof. M.G.K. Menon, Secretary,

Department of Science & Technology, and Director General, Scientific & Industrial Research, dwelt on the specific nature of science and technology to be transferred for the development of rural industries. The technology should be appropriate to the rural needs and serve the poorest of the poor, should be based on the use of locally available resources—human and material—and lead to a rise in productivity and improvement in income and employment, he said.

Prof. Menon opined that the whole process of identifying the need for rural technology and making it a part of the production process is a big challenge to the scientists and the whole method is in no way less sophisticated than the traditional research activities being conducted in the laboratories.

The get-together made some important recommendations on the mechanism of transfer, organizational changes needed inside an R&D laboratory and changes to be introduced in the policies, and organizations of rural development. It was urged that the interface between R&D institutions and the government departments should be

समन्वयक-गोष्ठी
वैज्ञानिक-गोष्ठी



The Prime Minister, Shri Morarji Desai, meeting the scientists and the social workers at the get-together. To the left of the Prime Minister is seated Prof. M.G.K. Menon, DGSIR

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further improved and better understanding between administrative structure of the country and the scientific culture should be created.

The following recommendations were made in the three broad groups:

Mechanism of transfer

The process of transfer of technology to rural artisans may be greatly improved if the present communications between the technology generating institutions on the one hand, and the government departments on the other, are further developed by better coordination, removal of certain rigidities of rules and regulations and changes of the attitudes of administrative and implementing agencies to involve the scientific community and institutions in development activities.

In rural development programmes current emphasis is on providing drinking water, but with low priority or no priority on sanitation. This will result in environmental degradation affecting the health of the people. The full benefit of improved health status of the community could be achieved only with simple technological solutions for

excreta disposal in the rural areas. Technology is already available in the country and should be effectively transferred by suitable community participation so that it is socially relevant, culturally acceptable and environmentally compatible. This massive expenditure-oriented programme can only be supported by the government.

Experiences have shown that it is convenient to organize, in the beginning, the transfer of technology in and near about the laboratories where the laboratories will have direct access to beneficiaries and wherefrom a direct feedback to the laboratories would be feasible. Each laboratory should adopt a group of villages for application of its research results in the development of that area.

Technology generating institutions should develop a closer reliance and collaboration with voluntary institutions working in the villages. These institutions have intimate contact with the people and are capable of understanding the implications of innovations for introducing proper socio-economic changes in the village life.

Organizational changes necessary

Scientists of the laboratories should not only engage themselves in developing know-how, but should take part along with voluntary agencies in gleaning and identifying R&D problems from the day-to-day live situation of the villagers. The role of scientific community in this respect should have to be different from that of the western world scientists, who can afford to be isolated from the bulk of the community.

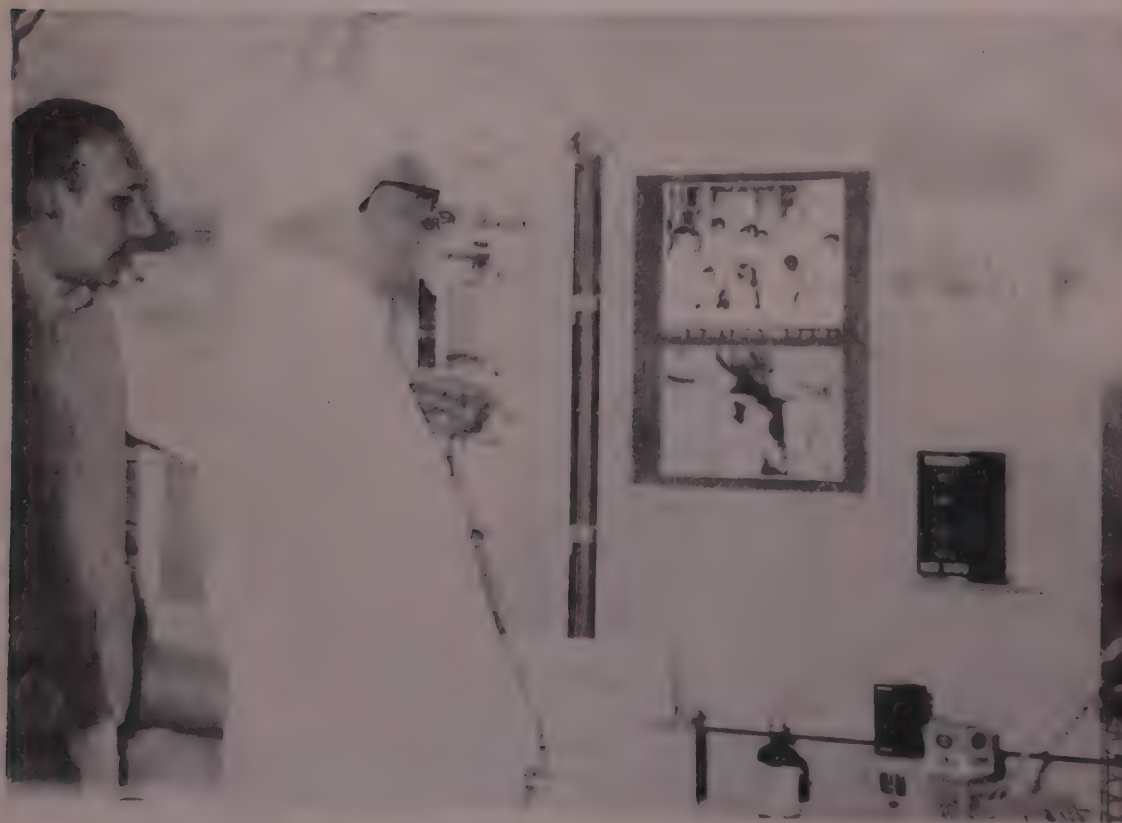
A need is felt to introduce a new culture in the scientific laboratories for effective orientation towards the services of the people in general, and the villagers in particular. The whole question of reward and punishment, incentives and motivations should be evaluated in the context of urgent needs of gearing R&D efforts towards the development and application of rural technology for improvement of the lot of the common man. The present discrimination between those who take part in rural technology and those who are engaged in research involving the use of sophisticated tools and resources should go. It will be underrating of the S&T task of rural technology within the constraints of resources to be treated as something simple.

Each R & D institution should organize a rural technology cell built up with the help of competent scientists and technologists who should be able to operate distinct budget and to encourage other sections of scientific community towards the cherished goals of identifying and working on R&D problems oriented towards rural development.

Environmental changes

The proposed District Industry Centres could play a bigger role by having a closer liaison with the scientific laboratories and educational research institutions at district and state levels. Moreover, the organizational structure of the district industry centre should be strengthened by introducing science and technology input.

The communication between the



The Prime Minister visiting a section of the exhibition

Khadi and Village Industries Commission (KVIC) and the R&D institutions for proper utilization of available technologies has been effective in certain areas. This interaction may further be developed in different areas by widening the scope of activities of KVIC and improving dialogues with CSIR and other laboratories.

A better liaison is desired between the rural technology activities of the national laboratories and the college and university system of the country.

The dissemination of scientific knowledge and technological developments devoted to the rural culture may be encouraged in regional language also. Special journals should be published for this purpose.

Young and committed scientists devoted to the cause of research in rural development should be encouraged through the award of fellowships on the basis of the relevant projects based on rural problems. Voluntary agencies like CSV may sponsor such candidates.

The spirit and message of science and technology should be in-built in the national adult education programme so that adult education becomes meaningful for induction of self help among the beneficiaries.

Scientists from the following CSIR laboratories took part in the get-together: National Metallurgical Laboratory, Jamshedpur; Central Mechanical Engineering Research Institute, Durgapur; Central Glass & Ceramic Research Institute, Calcutta; Regional Research Laboratory, Jammu; Regional Research Laboratory, Hyderabad; Central Salt & Marine Chemicals Research Institute, Bhavnagar; Structural Engineering Research Centre, Madras; National Environmental Engineering Research Institute, Nagpur; Central Leather Research Institute, Madras; and Central Food Technological Research Institute, Mysore. The Central Building Research Institute, Roorkee; Jamnalal Bajaj Centre of Rural Industries, Wardha; Khadi and Village Industries Commission; Raman Museum; and

Nagpur University also participated.

Prof. Menon welcomed the spirit of the recommendations and assured that every effort would be made by him to implement them.

An exhibition was also organized in connection with the get-together.

Dr Bhargava Elected FNA

Dr Pushpa Mittra Bhargava of the Regional Research Laboratory (RRL), Hyderabad, has been elected Fellow of the Indian National Science Academy.

Dr Bhargava has made significant



contributions in biochemistry and cellular and molecular biology. More important among his studies relate to preparation, properties and uses of liver and kidney cell suspensions. These studies stimulated scientific interest in this area in 1960s. He and his coworkers have discovered, and carried out studies, on three unusual new proteins from bovine seminal plasma — seminalplasmin, anti-seminalplasmin and ribonuclease SPL. This work has elicited considerable interest both from the practical and theoretical points of view. His group has also made important contributions to the understanding of the control of naturally occurring translational errors by the nutritional environment of the cell. A comprehensive model on regulation of growth through control of uptake of essential nutrients has received wide international attention.

Dr Bhargava has worked at many leading biochemical and biological research centres abroad, including McArdle Laboratory for Cancer Research, Madison, Wisconsin, USA (1953-56), National Institute for

Medical Research, London (1956-57), Institut du Radium, Orsay, France (1971-72) and Max-Planck Institut für Biophysikalische Chemie, Göttingen, West Germany (1976).

Dr Bhargava is recipient of several honours and awards which include fellowships of the Indian Academy of Science and the National Academy of Sciences (India), the Watumall Memorial Prize for Biochemistry and Eleanor Roosevelt International Cancer Research Fellowship. He is the founder of the Guha Research Conference, founder-member of the Indian Society for the Study of Reproduction and Endocrinology, and foreign and foundation member of the Society for the Study of Reproduction (USA).

Dr Bhargava has more than 100 research papers to his credit. He has delivered invited lectures at more than 100 scientific institutions in Europe, North America and the Far East, and has attended (as an invitee), more than 20 international meetings.

Dr Bhargava's interests include education, science policy, and development of scientific temper in India — areas in which he has published a number of articles and delivered more than 250 invited lectures.

Dr Bhargava, at present, heads the Centre for Cellular and Molecular Biology at RRL. In recognition of his contributions, he was given the pay scale equivalent to that of a Director in March 1977.

PID's Research & Specimen Cell

The Publications & Information Directorate (PID), New Delhi, is setting up a Research & Specimen Cell to collect, house, and identify raw materials of vegetable, animal and mineral origin. This cell will provide a nucleus for the future centre for the collection and identification of Indian raw materials. It will be of service not only to the research organizations but also to the industry.

A list of materials required for the cell has been drawn up and will be distributed to various organizations.

Cooperation of all such organizations is solicited for donations to the cell. Donations may be addressed to Shri K.

Kashyapa, Scientist, Publications & Information Directorate, Hillside Road, New Delhi 110012.

Primary Communication in Science and Technology in India: Seminar

Under the sponsorship of the Documentation Research and Training Centre (DRTC) of the Indian Statistical Institute (Bangalore), the Publications and Information Directorate (PID), CSIR, New Delhi, and the Department of Science and Technology, a seminar on Primary Communication in Science and Technology in India (PRICSTI) was held during 4-8 December 1978 at the Visvesvaraya Industrial and Technological Museum, Bangalore. The seminar was organized jointly by DRTC and PID. Prof. G. Bhattacharyya of DRTC was the convener of the seminar.

Prof. Bhattacharyya's Report:

The main objectives of the seminar were: (i) to gather research scientists, editors, information scientists, and printing technologists; and (ii) to initiate an interprofessional dialogue on generation, processing and printing, and dissemination of primary information. The major task of the seminar was to propose a programme of action to improve the quality of communication in science and technology in India. In the absence of Shri Y.R. Chadha, Chief Editor, PID, Shri R.N. Sharma (Editor, PID) officiated as director, and later S. Shankar (Editor, PID) in Sharma's absence. Prof. Charles P. Bourne, Senior Staff Scientist, Lockheed Missile Corporation, Palo Alto, California (USA), acted as the Resource Person of the seminar in which 107 delegates took part.

The seminar was spread over 16 plenary sessions. Prof. J. Ramaseshan of Raman Research Institute, Bangalore, delivered his keynote address on 'Publication of results of scientific research'. Shri R.N. Sharma, Head of Periodicals Division of PID (CSIR), spoke on 'Quality and standards of

scientific papers'. Printing and publication facilities in India was the topic of the address delivered by Shri R. Ramaswamy, Adviser, Printers (Mysore) Ltd.

The discussions were based on 42 papers from research scientists, editors, information scientists and printing technologists. There were 25 papers in the area 'Publication of results of scientific research'. The papers covered the topics: Publication channels; Status of Indian scientific periodicals; Indian research contributions in world's major scientific periodicals; and Role of scientific and professional societies in science publication. The studies covered the fields: physical and chemical sciences, chemistry, biochemistry, environmental science and engineering, metallurgy, high energy physics, solar energy, electrical energy, aeronautics, leather science and technology, and food technology. Eleven papers in the area 'Quality and standards of scientific papers' covered the topics: Criteria for quality; Refereeing system; In-house assistance to authors; and Editorial and related matters. Six papers in the area 'Printing and publication facilities in India and their problems' covered the topics: available facilities; new facilities—such as computer-aided printing, offset printing, and photocomposition; and future of scientific publications including periodicals. The proceedings of the seminar are expected to be published by PID.

An integral part of the PRICSTI seminar was the Sarada Ranganathan Lectures (1978) delivered by Prof. Charles P. Bourne. The theme of his lectures was 'Technology in Support of Information Activities'.

In its concluding session, the seminar adopted the following recommen-

dations which suggest a programme of action for improving the quality of communications in the field of science and technology.

RECOMMENDATIONS

I. Realizing that interprofessional dialogue and feedback among information scientists, editors, research scientists, and printing technologists is an efficient and effective means to ensure improvement of the tools and techniques of primary communication in science and technology, the seminar recommended that (1) scientific organizations—such as Department of Science and Technology, Council of Scientific and Industrial Research, Indian Council of Agricultural Research, Indian Council of Medical Research, Defence Research and Development Organisation, University Grants Commission, R&D departments of private organizations, industrial organizations, scientific and technological societies, associations and institutions, and Indian Statistical Institute—should encourage, promote and support the organization of interprofessional seminars, symposia, workshops, institutes and conferences; and (2) PID, as a national centre concerned with primary communications in India, should be entrusted with the responsibility of seeking support and organizing regularly such seminars, etc.

II. Realizing that training in technical writing and editorial practice can ensure better authorial and editorial performance, the seminar recommended that (1) universities and institutions of higher learning should introduce courses in this discipline for post-graduate students and doctoral candidates; (2) PID should be entrusted with the responsibility for conducting regularly an advanced course on technical writing and editorial practice at the national level under the sponsorship of the NISSAT programme of DST; and (3) the curricula and syllabi for such courses should be developed and revised from time to time by an expert committee consisting of members

drawn from the professions of research scientists, editors, information scientists, and printing technologists.

III. Recognizing that the primary motivation for publication of any creative worker/scientist is to get priority and credit, fair assessment by peers, recognition and reputation, and professional advancement in general, and in order to get the significant contributions by Indian scientists published in India, and in order to improve the quality and status of scientific periodicals in India, the seminar recommended the following plan of action: (1) to extend discussions with the scientific community so as to ascertain the requirement for a periodical in a particular field; and to get the collective support of the scientists working in that field; (2) to ensure that papers of high quality only are selected for publication in the periodical through the cooperation of the scientific community itself in the refereeing and the editing process; (3) to organize the publication procedure of the periodicals in such a way that it appears punctually; (4) to decrease the time-lag between the submission of a paper and its publication; (5) to announce the titles of the papers to be published in the forthcoming issues; (6) to make certain that the contents of the periodical are covered by abstracting and indexing periodicals as early as possible; and (7) to improve the quality of production in terms of printing, paper, and get-up.

IV. Realizing the need for assessment of the status and impact of contributions of Indian scientists and technologists relating to the world's scientific and technological output, the seminar recommended that scientific organizations should encourage, promote, and support such assessment studies from the points of view of both quality and quantity.

V. Realizing the problems associated with the refereeing system, as for example (i) delay in disseminating new information, (ii) personal bias manifesting in adverse reports, (iii) proneness to unscrupulous behaviour by referees

leading to rejection of good papers or acceptance of substandard papers, (iv) inconsistency in evaluation, and (v) editorial lapse in choosing appropriate referees, the seminar recommended the following plan of action to minimize the intensity of these problems: (1) to compile different disciplinewise comprehensive files of profiles of referees and to make them accessible to editors of different periodicals; (2) to design referee rating forms; (3) to introduce, wherever possible, a system of in-house evaluation of papers before submitting them to editors for publication; and (4) PID and INSDOC, New Delhi, should jointly be entrusted with the responsibility for compiling the file of profiles, and the referee rating forms, and of ensuring their use by various organizations.

VI. Realizing the difficulties currently faced in the country in printing and production of scientific periodicals, the seminar recommended that in order to ensure speed, efficiency, and economy in printing, the publishers and printers of scientific documents should make a concerted effort to develop an organized network of resources available for printing and publishing activities in India leading to the realization of the concept of a national science press; and to switch over gradually from conventional to modern methods of printing.

VII. Realizing the need for accelerating communication of nascent information of mutual interest to scientists and technologists, the seminar recommended that (1) a mechanism should be devised by which a large number of preprints that come into the country, addressed to individuals whose invisible colleges consist mainly of peers abroad, could be made available to others who mostly work in smaller institutions, and in isolation; (2) the mechanism proposed should consist of the following: (i) one or more institutions which are normally receiving a large number of preprints should function as depositories, and (ii) announcements about the availability of copies of preprints should be made preferably in the issues of fortnightly

periodicals; and (3) DST, under its NISSAT programme, should support the preprints project.

Krishnan Memorial Lecture 1978

The 1978 Dr K.S. Krishnan memorial lecture was delivered by Prof. R.S. Krishnan, Indian Institute of Science, Bangalore, at the National Physical Laboratory, New Delhi, on 4 December 1978. The topic of the lecture was 'Raman Effect: Discovery and After'.

CMRS's Microbiological Technique for Mining

The Central Mining Research Station (CMRS), Dhanbad, has developed a microbiological technology to extract metallic value from low-grade sulphide ores of copper. Extraction of these ores by conventional mining and metallurgical process is uneconomical. This technique has gained considerable popularity in USA and other countries. [See 'Useful Microbes Found in Indian Copper Ores' in CSIR NEWS, 29(1979), 1].

In this process, iron- and sulphur-oxidizing bacteria like *Thiobacillus ferrooxidans* are isolated from acidic mine water. These bacteria act as biocatalyst in the process of oxidation of iron and sulphur in an acidic medium. Hence, the sulphide ores of copper get oxidized into soluble sulphate, and copper can be extracted from the solution.

Various parameters controlling leaching operations were studied and about 90% of copper was extracted within a month from low-grade ores under laboratory conditions. The laboratory will carry out *in situ* trials on the recovery of copper from old workings of mines like Mosaboni, Rakha, etc.

Studies were also extended to utilize *Thiobacillus ferrooxidans* for desulphurization of pyritic coal from Assam coalfields. Initial trials in the laboratory indicated that virtually 100%

of the pyritic sulphur from this coal can be removed within two weeks. As the initial capital investment and manpower costs are low, the process is economical, besides being capable of recovering copper from the reject dumps, old workings, low-grade patches of the mines, etc.

For oxidizing methane, strains of *Methanomonas methanica* were also

isolated and adapted to such a condition that the strains could thrive in 100% methane. Studies were carried out to find suitable nutrients and additives for fast cell growth which give faster rate of methane oxidation. CMRS has plans to carry out investigations in gassy mines by injecting bacteria through boreholes in coal seams ahead of working faces to degasify the seams in advance.

ORGANOBORANES, ALLENES, MEDIUM-RING DIENES AND NOVEL HYDROCARBONS

BHATNAGAR PRIZE-WINNER LATE PROF. DEVAPRABHAKARA'S WORK*

Prof. D. Devaprathakara[†] has made significant contributions to the chemistry of organoboranes, allenes, medium-ring dienes and to the synthesis of novel hydrocarbons. He examined the behaviour of new substrates in novel organic reactions in order to understand the pathways of these reactions in general, and, in particular, to use such reactions in an effective synthesis of known or unknown novel hydrocarbons.

Organoboranes

Many new reactions of major significance to synthetic chemistry have been discovered via organoboranes.

Allenenes

Devaprabhakara synthesized representative members of acyclic and cyclic allenes by the best procedure known to date, and examined a number of reactions of allenes.

A detailed study of the monohydroboration and dihydroboration of representative acyclic and cyclic allenes was made to understand the direction of addition, reactivity, the effect of ring size,

and utility of the reaction in organic synthesis. The results enable one to predict the preferential site of attack of boron on the allenic linkage in any substituted allene. The results have been explained in terms of steric effect on the well-known four-centre transition state. Reasonable mechanistic pathways for the formation of the various products have been suggested.

Devaprabhakara investigated the behaviour of cumulated systems with a hetero atom. He synthesized substituted ketenes and investigated their behaviour towards monohydroboration and dihydroboration.

Devaprabhakara synthesized allyl organoboranes by monohydroboration of monosubstituted and 1,1-disubstituted allenes, and demonstrated that these allyl organoboranes undergo allylic rearrangement during protonolysis with acetic acid, and also reacted with aldehydes and ketones to produce α,β -unsaturated alcohols. These reactions have been visualized through a six-membered transition state.

The cyclic hydroboration-isomerization-oxidation of medium-ring dienes, viz. *cis,cis*-cyclooctadienes (1,3-, 1,4- and 1,5-), *cis,cis*-cyclononadienes (1,3-, 1,4- and 1,5-) and *cis,cis*-1,6-cyclodecadiene, proceeds preferentially to the *cis*-1,5-cyclic diols. These results have been explained via the bicyclic organoborane in-

termediates. The procedure provided a convenient stereospecific synthesis of *cis*-1,5-cyclic diols in nine- and ten-membered rings for the first time. The divergence in the behaviour of isomeric cyclodecadienes (*cis,cis*-1,5-, *cis,cis*-1,6- and *cis,trans*-1,5-) brings forth configurational and conformational effects in hydroboration.

Bicyclic organoboranes prepared from *cis,cis*-1,5-cyclooctadiene, *cis,cis*-1,5-cyclononadiene and *cis,cis*-1,6-cyclodecadiene have been found to form unusual product(s) on treatment with chromic acid or alkaline silver nitrate. Reasonable mechanistic pathways have been proposed to explain the formation of unexpected product(s).

A novel and a new elimination reaction of *vic*-diorganoboranes with CrO_3 was discovered by the prize-winner. The stereochemistry of this elimination reaction was established as *cis* by the use of diastereoisomeric diorganoboranes. A one-step pathway was suggested as the most likely mechanism of this reaction. Furthermore, the extension of this new reaction to *gem*-diorganoboranes also resulted in the formation of olefins which could arise via carbene intermediate by α -elimination process.

Medium-ring dienes

Devaprabhakara synthesized and characterized two new medium-ring dienes, *cis,cis*-1,5-cyclononadiene and *cis,cis*-1,6-cycloundecadiene. He showed that *cis,cis*-1,5-cyclononadiene underwent transannular reactions with electrophilic reagents like bromine, hydrogen bromide, mercuric acetate, iodine azide and lead tetraacetate to form *cis*-hexahydroindane derivatives via $\text{C}^+-\pi$ interaction. In addition, the diene made metal π -complexes with Ag^+ , Cu^+ , Rh^+ , Pt^{2+} and Pd^{2+} which were characterized by analytical data and spectral properties. Possible pathways were proposed to explain the stereospecific cyclizations of *cis,cis*-1,6-cycloundecadiene.

Devaprabhakara demonstrated for the first time that even 1,3- and 1,4-

*Prof. D. Devaprabhakara, Department of Chemistry, Indian Institute of Technology, Kanpur, was posthumously chosen for the Shanti Swarup Bhatnagar Prize in chemical sciences for the year 1976 [CSIR NEWS, 28(1978), 113].

[†]We regret we could not procure a photograph of late Prof. Devaprabhakara

dienes like *cis,cis*-1,3-cyclononadiene and *cis,cis*-1,4-cyclononadiene were capable of undergoing transannular addition reactions and formed π -complexes with certain metals. He also examined some of the new transannular reactions of known dienes, *cis,cis*-1,6-cyclodecadiene and *cis,trans*-1,5-cyclodecadiene.

Novel hydrocarbons

Devaprabhakara devised some convenient procedures for the synthesis of *cis*- and *trans*-cyclotridecene from cyclotridecyne. The isomerization reactions of cyclic allenes find use in a synthesis of 1,3-cyclic dienes. A convenient synthesis of C-13 cyclic cumulene, 1,2,3-cyclotridecatiene, hitherto unknown, was achieved in three steps starting from cyclododecene. The insertion reaction of a carbene species was used to provide a new highly strained hydrocarbon-tetracyclo[5.3.1.0^{1,6}.0^{6,11}]undecane. The carbene intermediate was generated through the reaction of 11,11-dibromotricyclo[4.4.1.0^{1,6}]undecane with methyllithium. The structure of the strained hydrocarbon was established by physical methods.

A highly strained bicyclic allene-bicyclo[3.2.1]octa-2,3-diene intermediate was generated and captured through addition reactions during the dehydrobromination of 3-bromobicyclo[3.2.1]oct-2-ene. The study provides compelling evidences for the transitory existence of this highly strained, and yet unknown bicyclic allene.

Devaprabhakara achieved a new route to the highly strained benzocyclopropene and its halo derivatives from halo substituted bicyclo[4.1.0]heptanes through dehydrohalogenation reaction. He obtained evidence for the reaction pathway of this interesting selective transformation. This new route opened a way to make substituted benzocyclopropenes.

The known methods of building caryophyllene skeleton involve multi-step sequences. Devaprabhakara syn-

thesized the caryophyllene skeleton in two steps from 1,2,6-cyclononatriene. The procedure is illustrated in the synthesis of isocaryophyllene. The sequence provided a simple and effective synthesis of caryophyllene system.

The late Prof. Devaprabhakara (born 13 November 1932) did his B.Sc.(Hons) (1954) and M.Sc. in organic chemistry (1955) from the Mysore University, and Ph.D. (1962) from the University of Texas, USA. He was a lecturer at the Science College, Bangalore, during 1955-59. He worked as a post-doctoral research associate at the University of Texas (1962-63) and as a CSIR Pool Officer in the Indian Institute of Science, Bangalore (1963-64). He joined the Indian Institute of Technology (IIT), Kanpur, as a lecturer in 1964 and rose to the position of Assistant Professor (1966), Associate Professor (1971) and Professor (1975). He died in harness on 12 January 1978 of a heart attack.

With his extensive teaching and research experience in organic chemistry, Prof. Devaprabhakara developed a number of teaching models (e.g. ball and stick molecular models, models to show the shapes of atomic orbitals and hybrid orbitals).

Devaprabhakara was member of Sigma Xi; Phi Lambda Epsilon; Inorganic Chemists Association; Indian Chemical Society; Chemical Society, London; and American Chemical Society. He was a fellow of the Indian Academy of Sciences.

Devaprabhakara published 70 research papers and presented 22 papers in conferences. He guided thirteen Ph.D. students.

PERSONNEL NEWS

Appointments/Promotions

Shri O.N. Chaddha

Shri O.N. Chaddha has been appointed Scientist E1 at the National Botanical Research Institute (NBRI), Lucknow, with effect from 13 December 1978. Prior to his joining NBRI, Shri Chaddha was Scientist C1 at the Indian

National Scientific Documentation Centre (Insdoc), New Delhi.

An M.Sc. in zoology, Shri Chaddha (born 30 March 1945) started his career as a Scientific Assistant at the Central Inland Fisheries Research Institute, Barrackpore (1964-66). Joining Insdoc in 1966 as Senior Documentation Assistant, he underwent the Insdoc Training Course in Documentation and Reprography (designated as Training Course in Information Science since 1977) during 1967-68, securing first rank. He was promoted to Scientist B at Insdoc in 1970 and to Scientist C1 in 1974.

With his long experience in scientific documentation—covering, among other areas, creation of machine-readable databases and preparation of reference sources—Shri Chaddha planned, in collaboration with the Department of Science & Technology, a database of the current research projects in various organizations and institutions in India. The database, which is being created at Insdoc, is expected to cover about 25,000 research projects.

At NBRI, Shri Chaddha is in charge of setting up library and information services in botany.

* * *

The following personnel have been appointed Scientist B at the zonal laboratories of the National Environmental Engineering Research Institute (NEERI), Nagpur: Shri G. Sambiah (Kanpur Zonal Laboratory; 23 Oct. 1978); and Shri R. Jayabalu (Cochin Zonal Laboratory; 25 Oct. 1978).

Honours

Shri U.N. Nayak of the Central Glass & Ceramic Research Institute, Calcutta, has been nominated a member of the authorized board of Krishna Silicate & Glass Works Ltd, Calcutta, presently under the management of the Union Government.

Retirements

Shri S.L. Sethi, Administrative Officer, NEERI, Nagpur, has retired on superannuation (30 Nov. 1978).

PATENTS ACCEPTED

Indian Pat. 1547/Cal/76

Improved process for making a low-loss ceramic body for use in electronics and electrical industry

S.B. ROY, S.K. CHAKRAVORTY & D.D. CHATTOPADHYAY
Central Glass & Ceramic Research Institute,
Calcutta

The use of very high frequencies in telecommunication equipment, miniature transmitters and receivers, etc. has accentuated the need for developing ceramic bodies possessing extremely low dielectric loss at such frequencies, good mechanical and thermal properties along with non-absorbent surface, and amenability to fabrication by conventional forming methods.

The conventional ceramics used extensively for low-loss applications are steatite and alumina. These suffer from the drawback that a high temperature of the order of 1300-1450°C, or higher, is required in their production. Besides, in view of a very low permissible tolerance in firing temperature, there is a tendency for distortion in size or shape, and as a result the yield of satisfactory products is very low. Other drawbacks of such conventional low-loss ceramics are high shrinkage and low thermal stability, as a result of which it is difficult to get impervious products possessing close dimensional tolerance.

The process developed by the Central Glass & Ceramic Research Institute (CGCRI), Calcutta, and covered by this patent, eliminates these drawbacks. In the CGCRI process, an improved low-loss ceramic body which is free from the drawbacks of the existing bodies and is highly suitable for the ever-expanding electronic industry is made at a much faster rate and at a lower temperature (1150-1200°C). The basic raw material, wollastonite, is available in plenty in Udaipur. Like steatite ceramics, the low-loss wollastonite ceramics are suitable for applications as coil forms, trimmer bases, spacers, lead-through insulators, valve supports, etc. They have lower dielectric loss (L-6 or better), lower firing shrinkage, better thermal stability and

much lower firing temperature than steatite wollastonite.

In the improved process, a mixture of wollastonite powder (preferably pre-heated), clay and a fluxing material like barium carbonate, lead borate or lead bisilicate (preferably glass frits of suitable composition) is used for fabricating the desired shapes by pressing, casting or extrusion. The shapes are dried and fired at 1150-1200°C and finished by grinding, if necessary.

The characteristics of low-loss ceramics formed by this process are:

Sp. gr.	: 2.9
Modulus of rupture	: 900-1000 kg/cm ²
Firing shrinkage	: 12-14%
Water absorption	: Nil
Dielectric strength	: 300 V/mil
Dielectric constant	: 7.5-8.0
Power factor (%)	: 0.03-0.04
Loss factor (%)	: 0.3-0.4
JAN I-10 grade	: L-6
Vol. resistivity	: $3-4.5 \times 10^{15}$ ohm-cm
Te value	: 800°C
Maturing temperature	: 1130-1200°C

The composition and process parameters have been optimized on a bench scale. The adaptability of the process to conventional fabrication techniques has also been studied with success. The process is suitable for those firms which are engaged in the production of technical ceramics in general and steatite ceramics in particular.

PATENTS FILED

1335/Cal/75 (142763): A process for the recovery of vanadate from bauxite residue (red mud), R.S. Thakur, J. Muralidhar & B.R. Sant—RRL, Bhubaneswar.

2150/Cal/74 (142923): Improvements in or relating to the painting of rusted sheets, S. Guruviah, C. Rajagopal, K.S. Rajagopalan & M. Sundaram—CECRI, Karaikudi.

302/Cal/75 (142938): Improvements in or relating to the manufacture of μ size aluminium oxide of electronic grade from aluminium foil, G. Prasad—RRL, Jorhat.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 1/79

It is proposed to appoint a Scientist F (Deputy Director) in the Regional Research Laboratory located in Jorhat, Assam.

The RRL-Jorhat is a multidisciplinary institution covering the areas of analytical services, applied civil engineering, biochemistry, chemical engineering, coal, geoscience, inorganic chemistry, medicinal and aromatic plants, organic chemistry, papers and boards, and petroleum and natural gas.

Job Requirements. This is a senior research management position in the area of coal, a major R&D activity of this laboratory directed towards utilization of the vast coal resources of the north-eastern region. The selected candidate is expected to provide high level leadership to identify, plan and conduct R&D programmes and organize transfer of technology in these areas. He would also be required to assist the Director of the laboratory in management functions.

Qualifications: High academic qualifications in science, technology or engineering, of the doctorate level. Extensive experience of R&D in coal and related energy areas. Proven capability as independent investigator. Up-to-date knowledge of the coal and coal-based industries in the country and the world trends.

Salary/Conditions of Service: The salary scale attached to the post is Rs 2000-125, 2-2500. Initial pay will be fixed according to merits. The persons selected will be appointed on contract for a period of six years, which would be confirmed after an initial period of two years of satisfactory service. Other conditions of contract will be supplied on request. Qualifications and experience are relaxable in the case of candidates otherwise found suitable for the post.

Age Limit: Below 50 years, relaxable in special cases.

Scientists/Technologists interested may obtain a standard proforma, for sending their *curriculum vitae*, from the Chief (Administration), Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001 on or before 13 February 1979. They can also obtain a brochure on the aims and objects and latest annual report of the laboratory. Completed *curriculum vitae* proformae must be received in this office on or before 13 March 1979.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.

Indo-Bulgarian Protocol for Scientific and Technological Cooperation Signed

India and Bulgaria have signed an agreement for cooperation in science and technology. At a function held at the CSIR Headquarters, New Delhi, on 17 January 1979 the agreement was signed on behalf of the Government of India by the leader of the Indian delegation, Dr A.R. Verma (Director, National Physical Laboratory, New Delhi) and on behalf of the Bulgarian Government by the leader of the Bulgarian delegation, Prof. K. Serafimov (Chairman of the Bulgarian Space Committee).

A follow-up of the 1967 agreement for scientific and technological cooperation between the Council of Scientific & Industrial Research (India) and the State Committee for Science & Technology of Bulgaria, the current agreement en-

visages cooperation between the two countries in areas as varied as minerals and ore-dressing, metallurgy, agricultural engineering, corrosion research, cultivation of medicinal and essential-oil bearing plants, and ionospheric research.

In his brief introductory speech, Prof. M.G.K. Menon, Director General, Scientific & Industrial Research, and Secretary, Department of Science & Technology, expressed satisfaction on the success of the earlier agreement. He expressed the hope that this new science cooperation agreement for a longer period (1979-84) would enable more and more realization of the objectives.

Reviewing the progress of past cooperation, both sides expressed

satisfaction and recommended further augmentation of the exchange of scientists and specialists, as also of scientific information in future. Commendable progress has been made on the collaborative project in the field of ionospheric and space physics, and radio communication.

Answering questions from newsmen the members of the Indian and Bulgarian teams gave detailed accounts of the achievements made during the tenure of the last agreement: Six joint papers were published in ionospheric research; the first calibration rocket to study magnetic storm was launched; and the second rocket is ready with payload to be launched from India; and high milk-yielding buffaloes from India were taken to Bulgaria for research and cross-production.

The two countries have agreed for a rational exchange of licenses, patents and know-how and recommended to their component organizations to utilize these facilities in their respective countries. It was also agreed, on reciprocal basis, that scientists of cooperating institutions should be received in order they could attend national and international conferences and symposia on such areas as have been identified for cooperation.



Prof. K. Serafimov and Dr A.R. Verma signing the Indo-Bulgarian Protocol. Seated to the left of Dr Verma is Prof. M.G.K. Menon

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More UNDP Aid for SERC Projects

The United Nations Development Programme (UNDP) has agreed to provide a further assistance of \$ 11,40,000 to the Structural Engineering Research Centre (SERC), Madras. This amount is in addition to the already approved assistance of \$ 14,20,000 which was given to the laboratory for strengthening the R & D facilities and expertise in the areas of systems building and prefabrication, structural dynamics and machine foundations, pressure vessels, steel and light-metal structures, polymer concrete, model investigations, and computer software development for structural analysis. The UNDP assistance is in the form of services of experts, training to SERC scientists through fellowships, and equipment for R & D work in these areas.

The extension of the aid is intended to give additional thrust in these areas and to set up a research-cum-testing station for transmission-line towers. This modern tower-testing facility, with automatic loading and control equipment for monitoring the behaviour of towers up to failure, will be established in a hillside site near Madras.

SERC is well equipped with facilities for undertaking research and development work in the field of structural engineering. With the inputs provided through UNDP aid, the laboratory is capable of serving as a training centre for structural engineers from India and other developing countries.

CGCRI Develops Production Process for Copper Ruby Crystal Glassware

The manufacture of coloured crystal glasswares has been recently taken up in India. In this category, the copper ruby crystal glassware is attractive and

profitable, and is much sought after in the local as well as foreign markets. The process of production of both the cased copper ruby crystal glassware and the through-coloured copper ruby glassware has been developed by the Central Glass & Ceramic Research Institute (CGCRI), Calcutta. The process was worked out in a CSIR research scheme headed by Emeritus Scientist Dr S.N. Prasad.

In the CGCRI process, the blank glass used for making uncoloured crystalware is not changed; only the minor ingredients for obtaining copper ruby colour are added to the batch mixture. The process eliminates the use of costly constituents like zinc oxide and boric oxide. As a result, the cost of production is reduced by about 50%. The batch is melted under a controlled furnace atmosphere for a specified period until it is ready for working.

To make copper ruby cased crystalware the copper ruby glass is applied as a thin film on the colourless crystal body and is annealed with an appropriate time-temperature schedule to obtain the desired ruby colour. Selenium ruby glass is not suitable for this purpose and hence copper ruby glass is used in developed countries for producing cased crystal tablewares.

The through-coloured copper ruby molten glass can be shaped to obtain thick rods for supply to those manufacturers who would not like to invest in the production of copper ruby glass direct from the batch.

The know-how has been released to a manufacturer in India.

NGRI Participates in Science Congress Exhibition

The National Geophysical Research Institute (NGRI), Hyderabad, participated in the exhibition on the focal theme 'Science and technology in the coming decades in India', organized during the sixty-sixth Indian Science Congress session held at the Osmania University, Hyderabad, during 3-7 January 1979.

Some major R & D activities of the laboratory, like mineral exploration and airborne geophysical surveys for minerals, deep seismic sounding, groundwater exploration and management, and properties of the earth's interior, were portrayed through photographs and charts. The gravity map series of India, recently published by NGRI, and various instruments developed for aiding geophysical investigation were also on show.

The Prime Minister, Shri Morarji Desai, who inaugurated the focal theme exhibition and visited the NGRI stall, showed interest in the deep seismic sounding project. A large cross-section of the delegates to science congress visited the exhibition.

Member-delegates from Hungary, Czechoslovakia and UK visited the NGRI stall. Dr (Mrs) Hertha Firnberg, Minister for Science & Research, Austria, accompanied by the Austrian delegation, visited the NGRI stall and appreciated the work being carried out in the laboratory.

SERC at Rural Technology Exhibition at Wardha

The Structural Engineering Research Centre (SERC), through its regional centre at Roorkee, participated in the exhibition on the theme 'Science for Villages' organized at the Centre of Science for Villages, Wardha, from 30 December 1978 to 4 January 1979 on the occasion of the 40th anniversary celebrations of the Magan Sangrahalaya, Wardha. The celebrations were inaugurated, as reported in *CN**, 29 (1979), 9, by the Prime Minister, Shri Morarji Desai, on 30 December 1978. The Prime Minister visited the SERC pavilion at the exhibition and showed interest in the activities of the centre.

At the exhibition, SERC-Roorkee pavilion highlighted its technologies relevant to the rural sectors. The technologies were concerned with

*Henceforward *CSIR News* will be cited as *CN* in this newsletter.

ferrocement bins for storage of food-grains, ferrocement water tanks for hygienic water storage, and ferrocement gobar (cow dung) gas holders (as an economical alternative to steel gas holders) for gobar gas plants. Displayed at the exhibition were prototype models of ferrocement bins of 0.5 tonne and 1 tonne capacities, ferrocement water tank of 600 litres capacity and ferrocement gobar gas holder suitable for gobar gas plant of 2 m³ of gas per day capacity. A demonstration-cum-training programme was conducted by the scientists of SERC for the benefit of the local

artisans (masons) in the fabrication of bins and water tanks based on ferrocement technology and by using the casting process developed by SERC. A slide show was also held to explain the ferrocement technology as applied to rural development.

Prof. M.G.K. Menon, Director General, Scientific & Industrial Research, and Secretary, Department of Science & Technology, visited the SERC pavilion and discussed with the SERC scientists the project work on ferrocement bins, water tanks and ferrocement biogas holders.

CIRCUMVENTING THE BLOOD-BRAIN BARRIER

BHATNAGAR PRIZE-WINNER DR ANAND KUMAR'S WORK *

The most significant contribution of Dr T.C. Anand Kumar has been his discovery of the tanycyte ependyma and his definition of the role of this non-neuronal component of the brain in integrating the endocrine functions of the pituitary and the gonads. His subsequent studies led to the identification of specialized ependymal cells occurring in other regions of the cerebral ventricles and elucidating their role in neuroendocrine integration. He is also one of the first investigators to demonstrate the presence of gonadal hormones in the cerebrospinal fluid (csf) and to suggest that the csf actively participates in the intracerebral transport of biologically active substances.



These two lines of investigations have marked a bold departure from the conventional and traditional beliefs that all neural functions are effected by nerve cells and that all hormonal messages are exclusively transported by blood. These

investigations have highlighted the important role played by the non-neuronal, ependymal cells and the csf in neuroendocrine integration.

Anand Kumar has recently taken up the application of knowledge gained through basic researches to problems associated with health and disease. Having demonstrated the role of the csf in the transport of hormones to the brain, he has aimed his studies at finding methods for delivering drugs directly into the csf. Initial studies in this area have clearly demonstrated that a much higher concentration of steroids occurs in the csf after intranasal administration as compared with other routes conventionally used for administering drugs. Even compounds such as Dopamine, which do not normally traverse the physiological blood-brain barrier when administered systemically, do so when sprayed intranasally.

Anand Kumar's studies give reason to believe that substances sprayed into the nostrils are transported directly to the brain and the csf through the olfactory epithelium which constitutes the only barrier between the brain and the environment. Thus, substances administered intranasally show a preferential transfer into the csf as compared with other routes of drug administration, because drugs sprayed into the nasal

mucosa bypass the peripheral circulation and reach the csf directly.

Fertility Regulation

Anand Kumar has successfully tested the pharmacological efficacy of administering drugs through the nasal route in animal models. His studies have shown that ovulation can be suppressed by spraying microquantities of steroids intranasally. The dose of contraceptive steroids required to interfere with such of the neuroendocrine mechanisms in the brain, regulating ovulation, is extremely minute as compared with the dose required to be administered by other conventional routes for similar purposes. These findings have been hailed as a major contribution in the area of fertility regulation because of the drastic reduction in the amount of drug required for contraceptive purposes.

The World Health Organization (WHO) has recognized the singular advantage of delivering contraceptives as nasal sprays and has set up a separate multidisciplinary, international task force to carry out these fundamental discoveries to their logical conclusion. A multicentred phase I clinical trial is currently being carried out under the aegis of WHO in Australia, Korea, India, Germany, Sweden, UK and Mexico to determine the feasibility of using nasal spray contraceptives for regulating human fertility.

Anand Kumar's method for delivering drugs to the brain by circumventing the blood-brain barrier is a significant contribution to medical science. The finding of a preferential and rapid transport of certain substances into the brain following the intranasal administration have opened out new vistas in developing the newer therapeutic modalities for treating a wide variety of cerebral disorders and diseases. The intranasal approach to drug-delivery holds out future promise for treating cerebral infections and mental disorders by the intranasal administration of drugs. It should also be possible to administer vaccines (e.g. anti-rabbies vaccines) and antimitotic

*Dr T.C. Anand Kumar, Associate Professor of Experimental Biology, All India Institute of Medical Sciences, New Delhi, has been chosen for the Shanti Swarup Bhatnagar Prize in biological sciences for the year 1977 [CN, 28(1978), 160].

agents for destroying metastatic cells in the csf through the nasal route. However, these therapeutic usages must be preceded by investigations relating to their safety and efficacy. Anand Kumar's current researches are directed towards this end.

Primate biology

Anand Kumar's studies in primate biology have ranged from the study of oogenesis in prosimian primates to the establishment of a Primate Research Facility at the All India Institute of Medical Sciences (AIIMS), New Delhi. The largest of its kind in India, the facility provides appropriate animal models for studying various aspects related to human health and disease.

Anand Kumar's contributions in primate biology have been recognized by the International Primatological Society which has elected him Secretary for Asia to its Executive Council.

Dr Anand Kumar (born 18 January 1936) obtained his basic degree in biology from the Central College, Bangalore, and Ph.D from the Rajasthan University under the supervision of Prof. L.S. Ramaswami. He worked as Lecturer in the University of Mysore, Bangalore (1959-63), and University of Rajasthan, Jaipur (1963-64). Anand Kumar did his post-doctoral research with Lord S. Zuckerman at the University of Birmingham, UK (1964-68), where much of the foundations for his neuroendocrine researches was laid. He joined AIIMS as Senior Research Officer (1968) and rose to the positions of Lecturer (1969), Assistant Professor (1971), and Associate Professor (1977). At AIIMS, Anand Kumar has established a Neuroendocrine Research Unit, which covers a multidisciplinary approach ranging from electron microscopy to biochemistry and pharmacology.

Anand Kumar is a member of several learned scientific societies. He is on the editorial board of *Medical Primatology*. He has published more than 50 research papers.

PROGRESS REPORTS

CBRI Annual Report: 1977*

The annual report of the Central Building Research Institute (CBRI), Roorkee, for 1977, shows that the R & D activities of the laboratory continued to be in seven major disciplines: Building materials; Soil engineering; Efficiency of buildings; Building processes, plant and productivity; Architecture and physical planning; Fire research; and Rural buildings and environment. The laboratory had on hand 77 sponsored/consultancy projects. Of these, 40 projects were completed. The processes relating to bored compaction piles, corrugated roofing sheets from coir waste/wood wool, and *in situ* flooring composition for railway coaches were released to various parties.

Samples of copper mine tailings received from Hindustan Copper Ltd, Khetri, on evaluation, were found suitable for replacing dolomite powder in making concrete tiles. A masonry cement prepared by admixing 40% portland cement and 60% copper tailings conformed to IS specifications (1967—3466).

An accelerated field test was developed for determining lime reactivity of fly ash and other pozzolanas like surkhi. Lime-pozzolana mixed in suitable proportions were boiled in water and allowed to settle in a measuring cylinder. The increase in volume was related to the lime reactivity of pozzolanas. The method would enable field engineers to classify pozzolanas according to reactivity.

Studies on fibre-reinforced cement composites and concretes showed that replacement of 10-15% of cement by fly ash was possible without lowering the flexural strength of the steel fibre reinforced sheet below the specified minimum.

Corrugated roofing sheets of sizes of up to 2 m × 1 mm × 6 m were prepared from coir, wood wool and pine needles.

These sheets required 30% less cement as compared to A.C. sheets and had a bending strength equivalent to that of A.C. sheets. They were light (11-12 kg/m²), tough and possessed good thermal insulation (0.9 kcal/m² hr °C) and fire-resistance properties. An experimental hut erected in 1974 with these sheets as roofing did not show wetting of the ceiling during rainy season. A demonstration-cum-pilot plant production of these sheets from coir was carried out at Calicut for the Kerala Housing Board, Trivandrum.

A simple and easy-to-operate device to carry out *in situ* shear tests in a borehole was developed. The device consists of two curved plates fixed with a hydraulic jack. The design and development of a sub-soil deformeter was completed. Fifteen designs were prepared to cover various types of transmission-line towers in Dubai.

At the request of Indian Farmers Fertilizers Cooperative Ltd (Phulpur Project), an analysis of soil investigation data for foundations of cooling towers and tanks was made. The laboratory suggested a floating raft foundation (without piles) as a possible alternative to piles for the cooling towers of two plants and two tanks. For the naphtha tanks, pile foundations were recommended.

An economical solar water heater with a built-in storage tank (100 litres capacity) was developed. The heater consists of a number of pipes which perform the dual function of absorbing heat and storing the heated water for use during the day. It attains a temperature of 67-70°C in the afternoon.

A thin *in situ* reinforced concrete ribbed slab scheme, suitable for floors and roofs of residential buildings, has been developed. It consists of 5 cm thick R.C. slab with ribs at the rate of 90-120 cm/cc. When implemented, the scheme would result in a saving in concrete (33%) and steel (35%) as compared to traditional R.C. slab.

The laboratory developed a new design and construction technique for construction of school buildings at

*This report is included as CBRI was part of CSIR till 31 March 1978 [CN, 28 (1978), 73].

Manipur. Based on the design and technique, 60 school buildings were constructed. The laboratory has plans to construct 100 more such buildings in the state.

Work on the construction of the first phase of the Mathura Oil Refinery Township was completed according to a master plan prepared by the laboratory. To evaluate the planning and designing performances of the townships and housing cluster, feed-back studies were undertaken.

The laboratory paid particular attention to low-cost housing. The Ghaziabad Development Authority undertook the construction of 1800 houses for EWS (economically weaker sections) by adopting the prefab brick panel system for roofing and precast lintels for doors and windows. The Gujarat Housing Board completed the construction of 200 EWS houses. At the request of Harijan Evam Nirbal Varg Awas Nigam Ltd, Uttar Pradesh, CBRI prepared designs for houses costing Rs 1060 for one-room accommodation (permanent skeleton only) and Rs 3000 for a house with a room and a verandah (full house with mud floor).

Sixty-nine papers were published and 46 papers were presented in seminars or symposia.

CSIR'S EXTRAMURAL RESEARCH

Improvement in Performance of Foundry Cupola

Cupola has become the most common melting unit in cast-iron foundries because of its low cost of installation, ease in operation, capability for continuous melting of metal at uniform rate, low cost of production, etc. Cupola furnace is rated in terms of the amount of metal melted per hour. The rate of melting depends on the fuel ratio or iron-coke ratio as well as on the rate of combustion, the latter varying with the pressure and volume of the blast supplied. The blast pressure employed,

in turn, depends upon the size and the profile of the cupola. The design of the cupola and its accessories and the quality of fuel play a very important role in achieving an optimal temperature of the metal, reasonable melting rate and trouble-free operation. The Indian foundries do not get good-quality coke, as a result of which they face several problems like low metal temperature, low melting rate and troublesome operation of the cupola.

In a new CSIR research scheme granted to them, Shri P.L. Jain, Principal Training Officer and head of the Department of Production Engineering, National Institute of Foundry and Forge Technology, Ranchi, and Shri K.S. Iyer and Dr P.K. Panda, both Assistant Training Officers (Senior) of the institute, propose to examine the design and process parameters of cupola furnace and its accessories in order to establish optimum design and process parameters suitable for indigenous quality coke so as to achieve a good metal temperature, high melting rate, and trouble-free operation. The results of the project are expected to help the Indian foundries in increasing the efficiency of their cupolas and enable them to effectively use the poor-quality coke to produce good-quality castings.

In the project it is envisaged to carry out (i) industrial survey in regard to the performance of different sizes of cupolas using indigenous quality coke; and (ii) critical investigation on heat transfer and combustion with different profiles and processes with necessary accessories.

Bimetallic Tetrathiocyanate Complexes with Biologically Active Ligands

Under a new CSIR research scheme granted to him, Dr S.A. Khan of the Department of Chemistry, M.L.K. (P.G.) College, Balrampur (Uttar Pradesh), proposes to synthesize bimetallic tetrathiocyanate complexes of the type $M[M'(SCN)_2]_2 \cdot xL$, where $M =$

cobalt(II), nickel(II) or copper (II); $M' =$ copper(I) or silver(I); $x = 2, 4$ or 6 ; and $L =$ biologically active ligands. These complexes will be characterized by elemental analysis, spectroscopic studies, conductance measurements and magnetic susceptibility determinations. The effect of various solvents on the complexes $[M'(SCN)_2]_2$ will be studied and a correlation between the donor numbers and dielectric constants will be attempted. The preference of the ligands to link with M or M' will also be studied. The preference will be determined by calculating softness values of metals and donor atoms of the ligands.

Group theoretical calculations will be made to support the proposed structures of the complexes.

PERSONNEL NEWS

Appointments/Promotions

Dr N. Ramanathan

Acting Director of CLRI

Dr N. Ramanathan, Scientist F, Central Leather Research Institute (CLRI), Madras, has been appointed Acting Director of the laboratory (17 January 1979) consequent on the Director Prof. M. Santappa's being appointed Vice Chancellor of Sri Venkateswara University, Tirupati.

Shri B.R. Juneja

Shri B.R. Juneja of the National Botanical Research Institute (NBRI), Lucknow, has been appointed, on promotion, Scientist EI with effect from 28 October 1978.

Shri Juneja (born 1 Sep. 1929), obtained his M.Sc. in botany from the Aligarh Muslim University, Aligarh, in 1956 and started his career with the Publications & Information Directorate, New Delhi, in 1957. In 1960, he moved over to NBRI where he organized a discipline of information, publications and liaison.

At NBRI, Shri Juneja has compiled, edited and brought out annual reports,

brochures, pamphlets and handouts of the laboratory. He designed the format of 'NBG Bulletins' and was its first editor. He has been editing the NBG (NBRI) Newsletter.

Shri Juneja has been associated with the formulation and evaluation of NBRI's R & D programmes, as well as the annual and five-year plans of the laboratory, and is currently a member of NBRI's executive committee.

Shri Juneja has liaised, on behalf of the laboratory, with CSIR and such committees as the CSIR Review Committees, PAC Committees, and Administrative Reforms Committee on the one hand, and industry, other R & D organizations and the public on the other. He has organized the laboratory's pavilion at a number of exhibitions and was a coordinator for a group of 14 CSIR laboratories taking part at the ASIA-72.

Shri Juneja now heads the Economic Botany Information Service as well as the Discipline of Information, Publications, Planning and Liaison.

Dr P.C. Jain

Dr P.C. Jain of the National Physical Laboratory (NPL), New Delhi, has been promoted, on assessment, from the position of Scientist C to that of Scientist EI with effect from 1 October 1977.

Dr Jain (born 5 Oct. 1931) has had a brilliant academic record obtaining M.Sc. (first class first, 1952) and Ph.D. in physics from the Lucknow University.

Dr Jain joined the Weights and Measures Division of NPL in 1953 and has been continuing to work there since then. He has made noteworthy contributions to organizing the standardization, calibration, testing and training facilities in the division. He received practical training in length and mass standardization and engineering metrology in PTB, Germany; NPL, UK; and NEL, UK. He also carried out research in heat transfer at the University of Illinois, Chicago, USA.

With his research interests in metrology and transport properties of gases, Dr Jain has published 48 research/technical papers.

Dr Jain is a member of the Institute of Standards Engineers and is associated with several technical committees of the Indian Standards Institution.

Shri M.K. Das Gupta

Shri Mrinal Kanti Das Gupta of the National Physical Laboratory (NPL), New Delhi, has been promoted, on assessment, from the position of Scientist C to that of Scientist EI with effect from 1 December 1977.

Shri Das Gupta (born 10 Nov. 1936; Ranchi) obtained his B.Sc. (Engng) degree in mechanical engineering from the Banaras Hindu University, Varanasi, in 1961. He started his research career at NPL the same year. At NPL, Shri Das Gupta has been concerned with materials testing and design and fabrication of equipment needed for this purpose. Along with his colleagues Shri Das Gupta has designed and fabricated dead-weight machine and hydraulic multiplication system for calibration of force-measuring instruments. These instruments are needed in the calibration of a variety of equipment like universal testing machines, aircraft weighing system, and thrust measurement of rockets.

Shri Das Gupta received advanced training in engineering metrology in the laboratories in FRG, GDR and UK in 1966 and 1974.

In 1975 Shri Das Gupta, and his colleagues, developed a Carlson-type strainmeter. The know-how for the device has been released to a private industry through the National Research Development Corporation of India.

Shri Das Gupta, who is now in charge of the Force Standard Division of NPL, is engaged in providing standard facilities for calibration of force-measuring instruments capable of measuring force up to 1 meganewton. His technical expertise is availed of by the Indian Standards Institution in the areas of nondestructive tests on helmets.

Honours & Awards

NRDC Award for CMRS Scientists

Dr J.K. Sinha, Shri P. Kunhunnu and Shri Subhrendu of the Central Mining Research Station (CMRS), Dhanbad, figure among the eight scientists who will get 1979's Republic Day awards for meritorious inventions instituted by the National Research Development Corporation of India (NRDC). A joint award of Rs 3000 has been announced for the three scientists for developing a dust extractor.

Krishnan Medal to Dr H.K. Gupta (NGRI)

Dr Harsh K. Gupta of the National Geophysical Research Institute (NGRI), Hyderabad, has been awarded the Krishnan Medal of Indian Geophysical Union for the year 1978. He shares the award with Shri D.N. Avasthi of the Oil & Natural Gas Commission.

Dr Gupta has made significant contributions to geodynamical investigations in the Himalaya and the adjoining regions.

He provided the first convincing geophysical evidence of an enormously thick crust in the Himalaya and the Tibet Plateau region; this evidence has been established by later work. He delineated the common characteristics of reservoir-induced earthquakes (i.e. those earthquakes which are not associated with reservoirs) of the concerned region. These criteria are now internationally applied, and are also finding use in earthquake prediction.

Dr Gupta has published, in association with his colleagues, about 50 research papers in international journals. He has also edited two volumes—one on Seismology and the other on Geodynamics. He has co-authored a book on reservoir-induced seismicity,



entitled *Dams and Earthquake*, published by Elsevier Publishing Company, Amsterdam.

Dr Gupta was a recipient of Unesco fellowship for two years at the International Institute of Seismology and Earthquake Engineering, Tokyo. He was for about four years with the University of Texas, Dallas, as a Visiting Research Scientist and continues to hold the position of Adjunct Professor at the university. He is member-secretary of the working group on Himalayan Region of the Inter-Union Commission on Geodynamics.

* * *

Dr A. Ghosal of the Operational Research Group, CSIR, New Delhi, has been invited to act as chairman of the session 'Applied Cybernetics & Planning' at an international conference to be held under the auspices of the Institute of Management Sciences (TIMS) at Honolulu (Hawaii) in June 1979.

Obituary

Shri K.D. Sharma

It is with deep regret that *CN* records the sad and sudden demise, owing to heart attack, of Shri K.D. Sharma of the Centre for the Study of Science, Technology & Development (CSSTD), CSIR, New Delhi, on 24 January 1979. On official duty in Jammu, he was on his way to Srinagar when the end came.

Shri Sharma was with CSIR since 1965, and earlier he was a research officer in the Planning Commission.

An M.Sc. in physics from the Aligarh Muslim University, Aligarh, and a master's degree holder in economics from the Delhi University, Delhi, Shri Sharma had specialized in planning of R & D (at Planning Commission) and on science policy and science and society interface at CSSTD. The growth of the

centre owes considerably to Shri Sharma's initiative and hard work. He was a visiting fellow at the Indian Institute of Advanced Study, Simla, from 1974 to 1976, and a member of the International Council for Science Policy Studies.

Among the other contributions by Sharma, mention may be made of CLOSS (*Current Literature on Science of Science*), a monthly publication of the Planning Division of CSIR Headquarters, issued in cooperation with PID and Insdoc, which is concerned with the application of science and technology to development.

Retirements

Shri R.K. Hakoo, Senior Librarian, Publications & Information Directorate, New Delhi, retired on 31 December 1979 after 25 years of service.

Transfers

Shri D.D. Sharma, Administrative Officer II, PID, has been transferred, on promotion, to the Central Electrochemical Research Institute, Karaikudi. He left PID on 16 January 1979.

PATENTS ACCEPTED

Indian Pat. 68/Del/76

A process for removing hexavalent chromium from chrome sludge produced in bichromate plants prior to its disposal

P. V. VISWANATHAN, C. SANKARAN & P. R. KHANGAONKAR

National Metallurgical Laboratory Unit CSIR Complex, Madras

Chrome sludge is a waste product of the sodium bichromate industry and invariably contains soluble hexavalent chromium, which is highly toxic to living aquatic organisms and is known to cause lung cancer, skin irritation, kidney damage, intestinal inflammation and dermatitis. The sludge has to be treated to eliminate the hexavalent chromium prior to disposal, else the soluble chromium is likely to re-enter the water

stream from the place of disposal. Though there is no specification formulated for hexavalent chromium in solid wastes, a limit of 2 ppm is laid down by the Indian Standards Institution for liquid effluents. Several wet chemical methods are available to convert harmful hexavalent chromium to harmless trivalent chromium. However, these suffer from the disadvantages of high reagent costs, incomplete removal of hexavalent chromium, etc.

The patent covers a process for removal of hexavalent chromium from chrome sludge by thermal reduction of sludge with any solid carbonaceous reductant or oil or reducing gases containing CO, H₂, etc. Thermal reduction completely eliminates the hexavalent chromium by converting it to the trivalent, harmless state. The thermal reduction step is carried out generally at 250°-1200°C, preferably at 300°-700°C.

The process parameters have been studied for the total elimination of hexavalent chromium from chrome sludge. The process is cheap and simple to adopt as relatively cheaper reducing agents and lower temperatures are employed. The cost of treatment has been estimated at Rs 125-150 per tonne but can be cut down further if the facilities available in bichromate plants could be utilized to full advantage for the thermal treatment.

PATENTS FILED

297/Del/78: A process for the recovery of lead and zinc from moore cake, P.K. Sahoo, S.C. Das & P.K. Jena—RRL, Bhubaneswar.

722/Del/78: Improvements in or relating to the use of sodium phosphate for chemical phosphating, K.S. Rajagopalan, R. Srinivasan, N. Krithivasan, C. Rajagopal, M. Sethukumari & M.E.K. Janaki—CECRI, Karaikudi.

752/Del/78: A process for the preparation of new violet naphthostyryle disperse dyes for polyester fibres, N.R.



Ayyangar, R.J. Lahoti & D.R. Wagle—NCL, Pune.

723/Del/78: An improved process for the manufacture of diosgenin from the manufacture of diosgenin from *Costus speciosus*, M.C. Nigam, T. Sen, M.S. Siddiqui & L.N. Misra—CIMAP, Lucknow.

750/Del/78: A process for the preparation of new violet naphthostyryl-cationic dyes for application to polyacrylonitrile fibre, N.R. Ayyangar, R.J. Lahoti & D.R. Wagle—NCL, Pune.

770/Del/78: An improved process for the preparation of 3-aminobenzo(6,7)quinoxalin-4-one, V.K. Sharma, P.K. Saxena, C.R. Prasad & A.P. Bhaduri—CDRI, Lucknow.

583/Del/78: A process for the preparation of subdermal implants as long controlled release drug delivery for antibacterial and antiparasitic drugs, S. Singh, N.M. Khanna & Nitya Nand—CDRI, Lucknow.

716/Del/78: A level monitoring system for monitoring level of liquids, T.K. Saxena—NPL, New Delhi.

PATENTS SEALED

71/Del/76 (143253): Dezincing of steel scraps by leaching with inhibitor-impregnated acid, P.B. Mathur & N. Venkatakrishnan—CECRI, Karaikudi.

2462/Cal/74 (143273): Improvement in or relating to the manufacture of tricresyl phosphate (pure or isomeric mixture) from cresol (pure or isomeric mixture) and phosphorus oxychloride, V.N. Gupta, R.K. Mathur & J.N. Baruah—RRL, Jorhat.

2329/Cal/74 (143286): Improvements in or relating to electroplating of copper on stainless steel, B.A. Shenoi, R. Venkatachalam, S. Chakrapani & R. Subramanian—CECRI, Karaikudi.

749/Cal/75 (142955): Manufacture of potassium silicate by ion-exchange method, G.T. Gadre & U.K. Tipnis—CSMCRI, Bhavnagar.

1630/Cal/75 (143297): Ultrasonic probe for inspection of timber, concrete and like materials, V.N. Bindal, T.N.K. Menon & S.K. Singhal—NPL, New Delhi.

Industrial News Digest

This monthly bulletin brought out by the Industrial Information Service (IIS) of the Publications & Information Directorate, New Delhi, which has entered the second year of its publication, is being printed from January 1979. (Earlier it was being brought out in mimeographed form).

The current issue features India's sports goods industry in its 'Industry Profile' section.

Aimed at providing condensed technical and techno-economic information to industrialists, prospective entrepreneurs, and experts from both government and private agencies dealing with management and planning of industry, the digest welcomes contributions on new processes and products, and queries on industrial matters. The subscription rates for the digest are: annual—Rs 20, £ 4, \$ 8; and single copy—Rs 2, £ 0.50, \$ 1. Subscriptions by M.O., cheque or IPO

payable to 'Publications & Information Directorate (IIS)' should be sent to the Editor (Shri S.K. Nag).

CECRI News

The Central Electrochemical Research Institute (CECRI), Karaikudi, has started publishing its house bulletin from January 1979. The first issue of the quarterly bulletin (demy 4to; 12 pages) was released on 12 January 1979, the concluding day of the laboratory's silver jubilee celebration. It contains, among other sections, the Director Dr H.V.K. Udupa's introductory message, and a list of the members of staff who have completed 25 years of service at CECRI. The bulletin covers achievements and activities of the laboratory and also personnel news, and serves as a link between the laboratory and the industry and other organizations.

The format of the bulletin conforms, to a large extent, to that of CN.

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Advertisement No. 4/79

It is proposed to appoint two Scientist F (Deputy Directors) for the Centre for Cellular and Molecular Biology at the Regional Research Laboratory, Hyderabad.

Job Requirements: The incumbents should be able to organize research groups in the field of their research interests, and interact with other research groups at the centre. These are senior positions and are meant only for those who have already shown outstanding creative ability in one or more areas of modern experimental biology. The applicants should be familiar with the Indian environment in which research is carried out.

Qualifications: Essential: A doctorate degree in any area of modern biology or in a related area such as chemistry with at least 12 years' research experience in an area such as biophysical chemistry, biophysics, immunology, genetics, virology or biochemistry. The applicant should have established reputation as an outstanding research worker in the field.

Desirable: Experience of leading a research team and guiding research students. Familiarity with more than one area in modern biology that would make meaningful interaction with other members of the senior staff at the centre.

Salary Conditions of Service: The salary scale attached to the above post is Rs 2000-125/2-2500. Initial pay will be fixed according to merits. Persons selected will be appointed on contract for a period of six years, which would be confirmed after an initial period of two years of satisfactory service. Qualifications and experience are relaxable in the case of candidates otherwise found suitable for the posts. Other conditions of contract will be supplied on request.

Age Limit: Below 50 years, relaxable in special cases.

Scientists interested may obtain two copies of the standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific and Industrial Research, Rafi Marg, New Delhi 110001, on or before 3 March 1979. They can also obtain a brochure on the aims and objects and the latest annual report of the laboratory. Completed *curriculum vitae* proformae will be received in the office on or before 3 April 1979.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the posts.



CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

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Radio and Space Sciences Symposium: NPL

Fifth in the series, the Radio and Space Sciences Symposium: 1979 was held at the National Physical Laboratory (NPL), New Delhi, from 22 to 25 January 1979. Besides by NPL the symposium was sponsored by Indian Space Research Organization, Indian National Science Academy, Indian National Committee on Space Research (INCOSPAR), Indian National Committee for International Scientific Radio Union, and Indian National Committee on Solar Terrestrial Physics.

The annual symposia in Radio and Space Sciences could be traced to the symposia organized by NPL in connection with the national programmes of the International Geophysical Year (IGY) in 1960 and the International Year of the Quiet Sun (IQSY) in 1966. The NPL's Radio Science Division arranged later national symposia at two-yearly intervals under the titles: Magnetosphere-Ionosphere Interactions (1971), Aeronomy and Radio Wave Propagation (1973), and Earth's Near Space Environment (1975). Ever since, these symposia are being held at yearly intervals at Physical Research Laboratory, Ahmedabad (1976); Vikram Sarabhai Space Centre, Thumba (1977); and Andhra University, Waltair (1978).

The symposium under report covered all areas of space science and radio science, the earth's environment (extending from the troposphere to outer space), atmospheres of outer planets, the Sun, interplanetary and interstellar space. Two hundred and thirty-eight papers were presented at the symposium which spanned over 16 sessions. Additionally,



Inaugural meeting of the Radio and Space Sciences Symposium (22 January 1979). Dr A.K. Saha of the Radio Science Division, NPL, Convener, addressing the gathering. Seated on the dias are (from left) Dr Y.V. Somayajulu, In charge, Radio Science Division, NPL; Prof. M.K. Das Gupta, Calcutta University, Chairman, INCSTP; Prof. P.D. Bhavsar, ISRO, also Member-Secretary, INCOSPAR; Dr A.R. Verma, Director, NPL; Dr Atma Ram, Chairman, NCST; Dr A.P. Mitra, NPL, Jawaharlal Nehru Fellow; and Prof. B. Ramachandra Rao, Vice Chairman, UGC.

sixteen review talks were interspersed between the sessions. A popular lecture on 'Adventures in the Study of Solar Planetary History' delivered by Prof. D. Lal, Director, Physical Research Laboratory, Ahmedabad, was a special feature of the programme (see p.27).

Dr Atma Ram, Chairman, National Committee on Science and Technology (NCST), inaugurated the symposium. In his address, the NCST chairman recounted the pioneering contributions made by J.C. Bose, M.N. Saha and S.K. Mitra in radio communication and upper atmosphere, and expressed the hope that with proper dedication Indian scientists would be able to make further impact in this area. Dr Atma Ram now brought up the burning topic 'priorities and relevance of research', particularly in the Indian context. Stressing on the importance of communications, the NCST chairman said that poor



Dr Atma Ram, Chairman, NCST, delivering the inaugural address

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communication in the present world was a great hindrance to the development of a country. Therefore, anything that helps improve communication and makes our understanding better should be welcomed and should be intensively studied, he added. As to the relevance of the study of the upper atmosphere, Dr Atma Ram said: "We have various types of climates and the monsoon. This has its rewards and sometimes hazards on our country and, therefore, I do not think there will be anything more relevant than this particular subject". Because space research, in general, entails huge investments, the NCST chairman cautioned that Indian scientists should not spread their efforts too thin over a wide area to produce tangible results; rather, they should concentrate on relevant areas. At the same time, Dr Atma Ram stressed that Indian scientists should not lose track of developments taking place elsewhere.

Dr Atma Ram complimented NPL on its contributions made in this direction. While discussing the Indian government's science policy, the NCST chairman asserted that the government was for science, and pointed out that the government had increased financial inputs on science from Rs 4000 million to Rs 5000 million a year.*

Presented below is a brief account of the topics covered in the various sessions:

Session 1 was devoted to remote sensing of earth resources, mainly with satellites. The papers were concerned with water resources survey, and mineral survey. A talk on demonstrated applications in India of earth resources survey formed part of the session.

The second and third session, viz. astrophysics—planetary atmospheres; and X-ray and gamma-ray astronomy, began with the following talks respectively: (i) X-ray source at Cyg - X1

*It may be mentioned in this context, as revealed by the President of India, in his address to the Parliament on 19 February 1979, that the proposed outlay for scientific research in 1978-83 plan is Rs 24,910 million—almost double that in the Fifth Plan.

and the possibility of a black hole in the region, and (ii) Radio observations of the solar corona.

The study of the atmospheres of other planets, which are in different stages of evolution, gives insight into the history of development of the Earth's atmosphere and prediction of its future. The study of solar phenomena is intimately linked with major variations and changes in the atmosphere, upper atmosphere, geomagnetic phenomena and weather. Experiments in space vehicles have opened up the new area of X-ray and gamma-ray astronomy, because these rays are prevented by the atmosphere to reach ground level.

Session 4 was related to the ionospheric F-layer and atmospheric models. F-layer is involved in most long-distance HF communications. In recent years, efforts are being made to standardize both the neutral and ionized atmospheres with suitable models. Some groups in India are working on various aspects of building these models. The models would be useful in predicting the variations of the atmospheric parameters at various times and solar epochs.

The fifth session was devoted to cosmic rays, an area in which Indian scientists are carrying out experiments on the spacelab and space shuttle vehicles. The review talk, as also a few papers, dealt with such studies.

Discussions on satellite radio beacon studies, including those with some geostationary satellites, by various groups in India were held in the sixth session. A talk on the applications of these studies, with special emphasis on accurate standard time and frequency dissemination, was also arranged.

Sessions 7 and 9 were devoted to troposphere, stratosphere and mesosphere, and troposphere—upper atmosphere coupling. Review talks were delivered on (1) Climate modelling, (2) Ozone measurements in India, (3) Laser techniques of atmospheric probing, and (4) Stratospheric minor constituents.

Tropospheric studies are relevant to understanding the long-term climate

changes, on which current interest is growing. Tropospheric phenomena are also intimately linked with propagation of radio waves in the VHF, UHF and microwave ranges.

Interplay between the lower and upper atmospheres, in spite of the intervening quiet stratosphere, is becoming increasingly evident. Also, the stratospheric minor constituents like ozone, nitric oxide and aerosol layers are receiving more and more attention with regard either to hazards or to potential climatic change processes. New, powerful tools which use high-power lasers and MST radar are coming up. Balloon and rocket studies of these regions are also being intensified.

Session 8 on storms, disturbances and geomagnetism considered atmospheric changes with solar radiation and particle bursts that produce geomagnetic changes and disrupt radio communications.

The tenth session dealt with radio communication in general at various frequency ranges (from VLF to microwaves), ionospheric, tropospheric paths as well as trans-ionospheric communication. It also included a few papers on the prediction of propagation conditions at HF and higher frequencies.

Session 11 was on magnetosphere, micropulsations and whistlers. This is another area where satellite studies have opened up fresh possibilities, though ground-based studies of magnetic micropulsations and whistlers in the VLF frequency range provide valuable information. Observations in India at low geomagnetic latitudes supplement data from world-wide studies.

Fluctuations or scintillations of signals received from outside through the ionosphere and mechanisms causing the irregularities responsible for the scintillations was the subject of Session 12. The special phenomena observed near the magnetic equator were discussed in a review talk. Another review talk was on the dynamics of the ionospheric regions and the phenomenon of gravity waves.

Plasma irregularities and winds and drifts in the ionospheric heights were discussed respectively in Sessions 13 and 14. Special phenomena at the magnetic equator, the electrojet current system and the geomagnetic effects were discussed. Also discussed were the results of studies on meteor trails, both visual and radio, on which some groups are coming up in India. Meteor trail studies give vital information on the dynamics of the 80-100 km region, a sensitive link in the coupling of the lower atmosphere with the upper atmosphere. There were two review talks in this area.

Session 15 was on airglow, atmospheric emissions from excited molecules in the upper atmosphere. Line width broadening and other parameters allow estimation of thermal conditions at these altitudes. A few papers on collision processes relevant to the upper atmospheric studies were also included.

The last session, which contained papers outside the above areas, was concerned with low-latitude high-latitude coupling, a subject on which a review talk was also arranged.

A special talk arranged was concerned with the forthcoming total solar

eclipse (on 15 February 1980) over India and the programme of observations by Indian scientists.

This symposium has a special importance since the International COSPAR meeting would be held later in India (June 1979, Bangalore). The major topics of interest at this meeting would be equatorial aeronomy; remote sensing of water resources and minerals; gamma ray astronomy and prospects of space research in astrophysics; models of upper atmosphere—its structure and composition; and effects of magnetic storms and other disturbances.

ADVENTURES IN THE STUDY OF SOLAR PLANETARY HISTORY

Prof. Lal's Talk at NPL Symposium on Radio & Space Sciences



Professor Devendra Lal, Director, Physical Research Laboratory, Ahmedabad, gave a popular, run-mode talk on the title topic (illustrated with slides and enriched with quotations), at NPL, New Delhi, on 22 January 1979. Presented below is an abridged version of the talk, in rendering which into print an attempt is made to retain the flair and flavour of the original talk.

THE YEAR 1979 marks an elapse of 169 years since the discovery of the four Galilean satellites. This was a great discovery and must be reckoned in history as a great adventure in discovery. The Galilean planets occupy a special place in the history of science, for the satellites were used to obtain the first accurate measurement of the speed of light in 1656. Even today the satellites are exciting inasmuch as they provide extremely valuable data relevant to satellites as planetary bodies and also as bodies belonging to what resembles a miniature solar system.

All discoveries are important but some are more important; and that is a great discovery which leads to a radical change in concept.

And today we are having a whale of a time—a great adventure into the history of our solar system not because we are making new discoveries at an ever-increasing rate but because we are understanding the interrelationships between new discoveries. Of course, even today, the components of the solar system are being discovered. The objects Chiron and Kowal, the 13th satellite of Jupiter, and the Comet Kohoutek are some of the recent discoveries. A large number of asteroids are being continually added to the list.

The crux of the message which I want to first state and qualify later is that so far we have been seeing only the letters and the words of the script—or hieroglyphics—but now we can read the script.

All inferences about our Earth and solar system are derived by a phenomenological approach and what exists in remote worlds. By a comparative study of the vis-a-vis processes, we learn about the structures and processes:

1. Another galaxy (Sculptor) shows ours is also a spiral galaxy.
2. We learnt a great deal about our Earth when we saw it from space.

3. Our planet has had a very active history—its surface has repeatedly been molten, but when we look at Mars and Moon, we infer about what Earth must have looked like in the past.

From such observations we know how our solar system must have formed—from a mass of hot gas and dust.

But it is only during the last decade that we learnt to spot the birth of stars in space. Looking at Orion Nebula with a telescope, one will witness the birth of massive stars, hundreds of them, and will find an enormous amount of evidence for the existence of young, ordinary stars like our Sun.

SOME TOPICS IN THE STUDY OF THE SOLAR SYSTEM

The main aim of this clearly-defined new field is to trace the evolutionary path of the solar system. In cosmology, a theory is continuously put to test with time as new data come in. The longer a theory survives, the more likely is it to be correct.

The beauty of the present status in this field is that there is a lot of information on various topics which places constraints on any hypothesis derived from any individual observation. Cases of special interest today are: (1) Magnetic field evolution of planets; (2) Evolution of the surface of planet; land-ocean dichotomy/beginning of plate tectonics; (3) Accretionary history of asteroids and meteorites; (4) Planetary ionospheres and magnetospheres.

MAGNETIC FIELD

The presence of an active dynamo in the interior of a planet tells about the present state inside and the possible history of the time development of the liquid core.

The first exciting direct study of the magnetic field of an extra-terrestrial system was that of the Moon which was found to have an

intrinsic global field, but a very weak one. The dynamo may have been there in the early history, but it is not there now. New data pertain to the magnetic fields of Mercury, Venus, Mars and Jupiter.

Studies on magnetic field are still in infancy. They also relate to the ionospheres and magnetospheres of the planets. The field is practically in a virgin state. Recent studies have shown that terrapocentric theories are extremely inadequate to explain even the relatively simple Venusian and Martian ionospheres.

COMPARATIVE PLANETOLOGY

The science of a planet is how its surface evolved, how its interior heated up and differentiated, and how these processes developed with time? It is essentially like having a complex n -parameter function. The function is extremely sensitive to some parameters and also often horrendously nonlinear. See for example: (1) The Earth and Venus, of nearly the same size and situated close to each other, have evolved so differently. Venus probably has no dynamo. (2) The Galilean satellites are so profoundly different in so many respects from the terrestrial planets: Mercury and Mars. The Galilean satellites have a large amount of water, only little atmospheres, but very extended clouds of sodium and hydrogen—a big puzzle today.

Only when one sees such large differences in nature does one think of the basic processes. For example, it was only after 1970 John Lewis pointed out on the basis of extremely simple and first-order calculations in the case of low-density satellites, because of their relatively large size and the presence in them of large quantities of low volatiles, the result that as the interior gets heated owing to radioactivity, and as also to the low melting point of ice, silicates will quickly sink and form a muddy core and the outer 30% or so of the planetary radius will be composed of water and ice. An interesting but most surprising calculation!—something which must have happened but was missed till one found evidence for large amounts of water in the Galilean satellites.

ROLE OF CRATERING IN SPACE

Cratering—a process associated with impact of high-velocity objects on other objects—has been a very important process in the history of the solar system. It, of course, sculpted the planet's exterior. But above all, the growth of planetesimals and the evolution of orbits of asteroids and streams in the solar system are all controlled by cratering. A remarkable aphorism is that in order to create something you have to destroy something. We have craters on the Earth—but most of them have been obliterated by erosion due to wind and water.

The Moon's geologic evolution stopped nearly 3 billion (3×10^9) years ago. The lunar surface is therefore a fossilized record of the early processes that shaped its relatively simple surface. The Earth's evolution has been by contrast dynamic and apparently continuous for the last 4.5 billion years: so great is its activity that the Earth has effectively erased all record of what was happening in the past. Perhaps observation of the Moon's early development can constrain the modelling of the Earth's first evolutionary period.

It is only recently that the full impact of these statements is being understood—in relation to the evolution of the Earth, oceans, crust, etc. However, oceanographers and geologists do not yet seem to appreciate the impact.

The term 'comparative planetology' was apparently first used by George Gamow in his popular classic *Biography of the Earth* (1948), but as a science such studies had to await the era of spacecraft exploration of the inner solar system. A major milestone in that

exploration was reached with the successful landing of both the Viking spacecrafts on the surface of Mars in 1976. Earlier, major events in the study of the terrestrial planets included the Mariner-10 triple flyby of Mercury, the highly successful Mariner-9 orbital mission to Mars, numerous other Mariner and Venera spacecrafts directed to Venus, and the unmanned as well as manned lunar missions which have returned 850 pounds of the Moon's surface to the Earth. The knowledge accumulated from these and related programmes presents a broad picture of planetary and solar system evolution: it is a picture into which the Earth fits admirably. The age of payoff for understanding the Earth through studies of other planets has arrived. Presented below is an example in which the comparative approach has provided invaluable insight into one of the most fundamental problems in the development of the Earth: the early evolution of the crust.

There remain many unanswered questions about the Moon, the least of which is the nature of its origin. But, the combination of ground-based observations, analysis of samples returned from six manned and three unmanned landings, and the photography and geochemistry from orbiting spacecrafts reveal a picture of lunar history far more complete than that of the Earth: Nearly all of the rocks returned from the Moon predate 99% of the material found on the Earth.

The modern crustal dichotomy (60 oceanic, 40 continental crusts) was established early in the history of the Earth. How does one understand it, particularly in relation to fractional area covered by old and new crusts on other planets?

Before 1960, geologists believed that continents and the oceans were fixed. Then came the concept of ocean floor spreading and plate tectonics—a revolution in earth sciences as significant as that in physics around the close of the nineteenth century.

It is now interesting to see what we understand today about the crustal dichotomy which seems to be a common feature on the Earth, the Moon, the Mars (and the Venus?). Earlier the basalt (and the highland) features were explained in some theories, also by invoking a basalt crust to begin with.

By a comparative planetological study we have been able to deduce what choices planets have, and what options exist for their evolution. We see that asymmetries in cratered lands depend on a particular configuration in early history, that the size of the planets defined:

- (1) interior structure, dynamo-sustained heating; and
- (2) how the second crustal differentiation occurred.

Finally we saw that the Moon and Mars both tried to develop the plate tectonics. Martian geologic development can be characterized as incipient plate tectonics. The planet looks like a Moon trying to become an Earth!

Another exciting result of comparative planetology is the formation of planetesimals, of minor bodies like asteroids, comets, and eventually planets. We learnt more about this field from two observations: (i) direct from Moon samples, and (ii) remote sensing of planets.

What happens to a grain exposed in space?

We have such powerful techniques that we can characterize the time evolution of a grain, thanks to the single fact that any material exposed in space is continuously subjected to cosmic influences. The entire process depends on the presence of particles of a great variety

and number in space; the method of characterizing the evolution works only for that part of the history when matter existed in free space.

The planetary explorations have led us into a new realm of study: we are able to ask how the planets evolved, we are able to understand how the planetesimals evolved. Alongside we have learnt how stars are born. One new observation at this point is that unmistakable

evidence has been found for transuranic long-lived and extremely short-lived isotopes in the solar nebula when planetesimals were being formed. This evidence definitely supports the supernova-type shock processes triggering the birth of our solar system. Our contemplations made on this planet Earth during the last decade have revealed the story of the birth, 4 to 5 billion years ago, of our solar system.

National Solar Energy Convention and Pre-Convention Workshop: CSMCRI

The National Solar Energy Convention of the Solar Energy Society of India (SESI) was organized during 18-22 December 1978 at the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar. As a prelude to this convention a two-day workshop on 'Desalination, Solar Pond and Rural Applications of Solar Energy' was also held.

Inaugurating the workshop, Shri Makarandbhai Desai, Gujarat's Minister of Energy, Mines & Metals, stressed the need for research on alternative sources of energy, and discussed the energy problems of the state and the role of solar energy in rural development. Commending the work of CSMCRI scientists in this area the minister indicated the intention of the government to provide drinking water for ten more villages through the solar stills, in collaboration with the laboratory.

Prof. C.E. Nielsen of the Ohio State University, USA, in his presidential address, stressed the need to reduce the costs of solar devices and to improve their reliability. He also stressed on the importance of biomass as energy source.

Prof. A.B. Meinel (and Mrs M.P. Meinel) delivered the keynote address on village energy centres.

Ten specialists delivered lectures on: Solar distillation; Distillation techniques for desalination; Reverse osmosis; Electrodialysis; Solar pond; Solar drying; Solar cookers; Solar refrigeration; Solar pumping; and Solar cells.

Prototype equipment which work on various desalination techniques were

demonstrated to delegates, who expressed the opinion that the government should come forward with more demonstration plants wherever the technology is available, and that financial institutions should support the organizations with soft loans. The delegates' consensus was that scientists should themselves set an example by using solar gadgets in their homes.

About 100 participants attended the workshop.

Two hundred and twenty-five delegates attended the convention, which was inaugurated by Mrs Sharada Mukherjee, Governor of Gujarat. Giving statistics from various industrialized as well as developing countries, the governor said that in

respect of GNP and per capita energy consumption, India was at the lowest rung. Energy availability was the key to development and if a cheap and abundant source of energy was made available, we could boost the development of rural economy and raise the living standards of our rural communities. She appreciated the stress laid by the convention on the role of solar energy in rural development. Emphasizing that the Centre and state governments should provide adequate funds for developing solar energy based technologies Mrs Mukherjee called for greater involvement by scientists, technologists, universities and research laboratories to solve the energy problem.

Shri Jahangir Cama, President of the Gujarat Chamber of Commerce, presided over the session.

Fifteen technical sessions were held



Smt. Sharada Mukherjee, Governor of Gujarat, delivering the inaugural address at National Solar Energy Convention. Seated on the dais are (from left): Dr D.J. Mehta, Director, CSMCRI; Shri.K.C. Mahapatra, District Collector, & Dr K.S. Rao, Deputy Director, CSMCRI

during 20-22 December 1978: Photochemistry/photobiology; Solar thermal power; Flat plate collectors (2 sessions); Rural applications of solar energy (3 sessions); Solar concentrators; Photovoltaics (3 sessions); Solar water heaters; Industrial application; Energy storage; and Solar miscellany. These sessions were followed by a poster session chaired by Dr B.R. Marathe.

At a forum session organized at the end, with Shri J.C. Kapur as moderator, the convention made certain observations and recommendations of which the following are the significant ones:

1. Despite the considerable amount of R&D work done the practical utilization of such work was not commensurate with the efforts. To achieve this, the government should provide incentives for solar energy utilization on the same pattern as given to biogas utilization.

2. Since solar water heating is both technically feasible and economically viable, the government should take the initiative to install, as an integrated assembly, solar water heating in public buildings to be built in future. These should be ultimately included in building codes.

3. Although solar energy can meet the requirement of energy in rural areas, there is no clear picture of the pattern of energy consumption in rural areas and, hence, solar energy has not made any penetration in the rural sector. A working group should be constituted for compiling a detailed report on rural needs, and a workshop should be held, under the auspices of SESI to discuss how best the penetration of solar energy in the rural sector could be achieved.

4. Solar energy should be introduced in the rural sector *not* in the existing framework of the energy consumption pattern, which is a duplicate of the policies followed in developed countries and from which they are retracting, but should be promoted in an objective manner.

5. A national integrated solar energy application programme should be evolved.

6. In view of the development of a large number of devices and equipment in the country, there is need for standardization, and therefore SESI, Indian Standards Institution and Department of Science and Technology, National Physical Laboratory and other organizations engaged in solar energy work should jointly set up a standardization and calibration facility, which should be funded by DST, industry, etc.

The valedictory function of the convention was addressed by Shri Babubhai Patel, Chief Minister of Gujarat, and Prof. R.S. Trivedi, Vice Chancellor, Bhavnagar University. Shri Patel stressed the need to develop an integrated energy system with solar energy, wind power and biogas. In his address, Prof. Trivedi emphasized the importance of creating awareness amongst the people on the energy problems and the role of educational institutions in handling such tasks. He also brought out the need for introducing multidisciplinary courses for training people to meet the challenge of the time.

CSMCRI Solar Energy Awards

At the concluding session, Shri J.C. Kapur and Shri M.K. Ghosh were awarded CSMCRI Silver Jubilee Solar Energy Awards—Shri Kapur for his excellent contribution in solar energy utilization in the country and building the world's second solar house, and Shri Ghosh for his contribution nearly 50 years ago and for his continued interest in solar energy.

PROGRESS REPORTS

CSIR Annual Report 1977-78

The Council of Scientific & Industrial Research (CSIR), New Delhi, has brought out its annual report for 1977-78. The 38-page (A 4) report highlights, briefly the R&D activities of the Council under the heads: CSIR and rural development, Benefits to the public

sector, R&D for industry, Collaboration with ministries/government departments, Instrumentation, Basic research, Dissemination of information, International collaboration, and Headquarters' activities.

CSIR's total expenditure for 1977-78 amounted to about Rs 5250 lakh; the non-plan and plan components being Rs 3400 lakh and Rs 1850 lakh respectively. The breakup of expenditure on the five coordination councils was: physical sciences — 18.63%; chemical sciences — 22.52%; biological sciences — 20.57%; engineering sciences — 32.80%; and information sciences — 5.84%. (This does not consider the expenditure on the coordination council for fibre sciences group).

According to the report, 48 CSIR processes went into production and 81 processes were released to industry for the first time. The total number of CSIR processes released to industry till the end of the year was about 1110; of these, 450 processes were reported to be in production. Nearly 650 sponsored research schemes having a contract value of over Rs 780 lakh were in operation; work on 120 schemes was completed. As many as 103 consultancy assignments, out of a total of 228 on hand, were completed. The Council received Rs 65 lakh as premia/royalties through the National Research Development Corporation of India. Of the 124 patents filed during the year, six were filed in foreign countries. One hundred and forty patents were accepted and 94 were sealed in India. The numbers of patents accepted and sealed in foreign countries were two and four respectively.

Low-cost housing, cultivation of aromatic and medicinal plants, exploration and management of groundwater resources, setting up of biogas plants, and marine aquaculture were some of the areas in which CSIR carried out R&D work to aid rural development.

The public undertakings which made use of the CSIR technologies include: Bharat Coking Coal Ltd; Bharat Heavy Electricals Ltd, Hyderabad; Central

Electronics Ltd, Sahibabad (Uttar Pradesh); Indian Drugs & Pharmaceuticals Ltd, Rishikesh; Oil & Natural Gas Commission; Hindustan Salt Ltd, Kharaghoda; Indian Petrochemicals Corporation Ltd, Baroda; Hindustan Insecticides Ltd; Alloy Steels Plant, Durgapur; Garden Reach Workshops, Calcutta; and Modern Bakeries.

Some of the products being produced on the basis of CSIR processes are anti-corrosive paints, electrical resistance alloy, electrolytic manganese dioxide, active carbons, bloating-type refractories, hydraulically operated wide leather-shaving machine, mini rice mill, glycerol monostearate and esterified wood resin, and zinc metal from galvanizers' ash. A laboratory prototype of a scanning electron microscope was developed. Technical know-how for the following instruments was released to industry for commercial exploitation: digital multimeter (ac/dc), digital panel meter, breath alcohol analyzer, altimeter, thermo-silico tester, fibre bundle strength tester, nip load meter, roller eccentricity tester, suction pressure gauge, starch refractometer, and fabric abrasion tester. A reflection calorimeter was fabricated for the friability estimation of iron ores. A rapid-response electronic rain gauge-cum-rate meter was designed and fabricated.

CSIR collaborated in the development programmes of a number of countries like Dubai, Saudi Arabia, Indonesia, and Australia. The Central Food Technological Research Institute, Mysore, is an associated institution of the United Nations University under the World Hunger Programme. The first phase of the project 'Marine Environmental Monitoring and Marine living Resources Assessment Programme for the Indian Ocean', sponsored by the United Nations Environment Programme, was completed by the National Institute of Oceanography, Goa. The first phase of work on research-cum-demonstration projects on slow sand filtration for small communities was completed by the

National Environmental Engineering Research Institute, Nagpur.

The report (editor: Shri N.R. Rajagopal of the Planning Division of CSIR Headquarters) lays accent on the general direction of work in which CSIR's activities were channelled.

Floristics and Phytogeography of the Forests of Kheri District

Shri K.K. Singh of the Division of Botany at the Central Drug Research Institute (CDRI), Lucknow, carried out an extensive survey of the flora of the Upper Gangetic Plain of Kheri district (Uttar Pradesh). The study covered the floristic survey, economic and medicinal importance of some plants, vegetative types, phytogeographical affinities and some new records of plants of the district. According to the survey, the forests could be divided into four groups: sal forests, mixed forests, swamp forests, and grasslands. The forests are of moist deciduous types and the flora comprised 821 angiospermic taxa belonging to 429 genera of 120 families. The phytogeographical analysis of the naturalized and indigenous species showed that there were 13 floristic elements in the vegetation of the district. Emphasis was laid on economic plants yielding timber, food and fodder, gums and resin, tannin and dye, and oil. The research also considered the biological activities of some plants as observed at CDRI.

Shri Singh, who worked under the guidance of Dr J.K. Maheshwari of the National Botanical Research Institute, Lucknow, was awarded Ph.D. degree by the Lucknow University for his thesis based on the studies.

Survey of Information Scientists in India: DSTP

The Division for Scientific & Technical Personnel (DSTP) of CSIR (located in CSIR Complex, Library Avenue, Pusa,

New Delhi 110012) has undertaken a survey of information scientists in the country, since data on the availability and utilization of information scientists in India are a prerequisite for planning future training and educational programmes in information science. It is needless to underscore the importance of information scientists with specializations in different areas for manning R&D organizations, industries, government departments, universities, and private technical organizations in the country. As the national development programmes are stepped up there would be an increasing need for such personnel. Information scientists would also be necessary to manage the regional and sectoral information centres proposed to be set up under the National Information System for Science and Technology of the Department of Science and Technology.

A background note and a set of three draft questionnaires to be filled in by (i) individual information scientists, (ii) employers and professional organizations/associations in information science, and (iii) institutions training information scientists, were sent to about 100 experts in different branches of information science in order to elicit comments and suggestions. A select gathering of information experts reviewed the replies and made some modifications in the questionnaires. Printed questionnaires are expected to be ready by April 1979.

It is proposed to conduct the survey by the cooperation of major employers, professional organizations/associations, and training institutions concerned with information science.

Information scientists, especially those who are currently unemployed, may obtain the questionnaire meant for individuals by writing to DSTP

PERSONNEL NEWS

Appointments/Promotions

At the National Geophysical Research Institute (NGRI), Hyderabad, the

following personnel were appointed under the PL-480 scheme on Precambrian of South India: Dr V. Divakara Rao (Scientist C), Dr P.K. Govil (Scientist B), and Dr B.L. Narayana (Scientist B) (all effective from 26 Dec. 1978).

Other appointments/promotions at NGRI include those of Shri S.I. Reddy (Scientist C, 20 Dec. 1978); Shri C. Subrahmanyam (Scientist B, 10 Nov. 1978); Shri N. Madhava Rao (Scientist B, 10 Nov. 1978); Shri I.B. Rao (Scientist B1, 13 Nov. 1978); Shri R.S. Saxena (Scientist B, 10 Nov. 1978); Dr S.N. Prasad (Scientist B, 10 Nov. 1978); and Dr M.V. Ramana Rao (R.M.O., 25 Sep. 1978).

Honours & Awards

Herdillia Award for Dr Doraiswamy

Dr L.K. Doraiswamy, Director, National Chemical Laboratory (NCL), Pune, has won the Herdillia Award for excellence in basic research in chemical engineering. He received the award at the annual meeting of the Indian Institute of Chemical Engineers held at Cochin in December 1978.



Dr Doraiswamy has made pioneering contributions to basic research in chemical reaction engineering and thermodynamics. The development of effectiveness factor for non-isothermal reactors under realistic conditions, a comprehensive analysis of various regimes of control of catalytic reactors and the establishment of certain original criteria, and development of a generalized zone model for gas-solid reactions, etc. are noteworthy among Dr Doraiswamy's contributions. A new, basket-type reactor developed by Dr Doraiswamy's group has been used in chemical engineering laboratories for obtaining kinetic data free of transport limitations. His work on the estimation

of thermodynamic and transport properties has been included in standard textbooks, adapted to computer simulation programmes and used in routine process design calculations, and taught in universities.

Dr Doraiswamy was the first to analyze solid-solid reactions from the chemical engineering point of view and to propose a self-consistent experimental strategy for measuring parameters in adsorption. The development of a mixed-tubular reactor based on the concept of semi-fluidization, a methodology for treating a large class of heterogeneous reactions by using the concept of effectiveness factor, a novel theoretical approach to the study of adsorption/catalysis by dividing non-ideal surfaces into finite and infinite limit problems, etc. are examples of original researches carried out by Dr Doraiswamy.

Dr Doraiswamy has tried to combine basic research with project work at NCL—a procedure which has been especially paying in the laboratory's process development programmes.

Shri K.D. Sharma

Shri K.D. Sharma, Director, Central Glass & Ceramic Research Institute, Calcutta, has been appointed chairman of the coordination council for engineering sciences group (with effect from 1 January 1979) in place of Prof. S.R. Valluri, Director, National Aeronautical Laboratory, Bangalore, who completed his two-year tenure as chairman. Shri Sharma will be the chairman till the date of his superannuation (31 July 1980).

Dr Nitya Nand

Dr Nitya Nand, Director, Central Drug Research Institute, Lucknow, has been appointed chairman of the coordination council for the biological sciences group for a period of two years with effect from 18 January 1979, in place of Prof. M. Santappa, Director, Central Leather Research Institute, Madras, who has

been released to join as Vice Chancellor, Sri Venkateswara University, Tirupati.

Transfers

Shri Krishan Kant has joined the National Geophysical Research Institute, Hyderabad, as Administrative Officer on transfer from the Central Leather Research Institute, Madras (5 Feb. 1979).

Obituary

Dr V. Subrahmanyam

CN records with deep regret the passing away, on 30 January 1979 at Tanjore, of Dr V. Subrahmanyam, 77, the founder-Director of the Central Food Technological Research Institute (CFTRI), Mysore.

Dr Subrahmanyam nurtured and built up CFTRI into a premier research institution in the tropics in food technology, particularly in the area of protein-rich foods and cereal technology. It was he who championed the use of oil-seed cakes for human food about 30 years ago, and this led to the production of a variety of high-protein foods for the vulnerable group of population. A signal development made under Dr Subrahmanyam's stewardship is the infant food based on buffalo milk, which has laid the foundation for a new baby-food industry in the country.



After retirement in 1963, Dr Subrahmanyam took up, for a brief period, an assignment with FAO as Advisor to the Philippines government. He continued his researches on processing and preservation of foodgrains as the project head of the Paddy Processing Research Centre, Thiruvavur, until his last day.

Dr Subrahmanyam's scientific achievements have won him worldwide recognition, laurels and awards.

At a condolence meeting held on 31 January the CFTRI staff paid their tributes to the late Dr Subrahmanyam.

CSIR NEWS

A FORTNIGHTLY HOUSE BULLETIN OF CSIR

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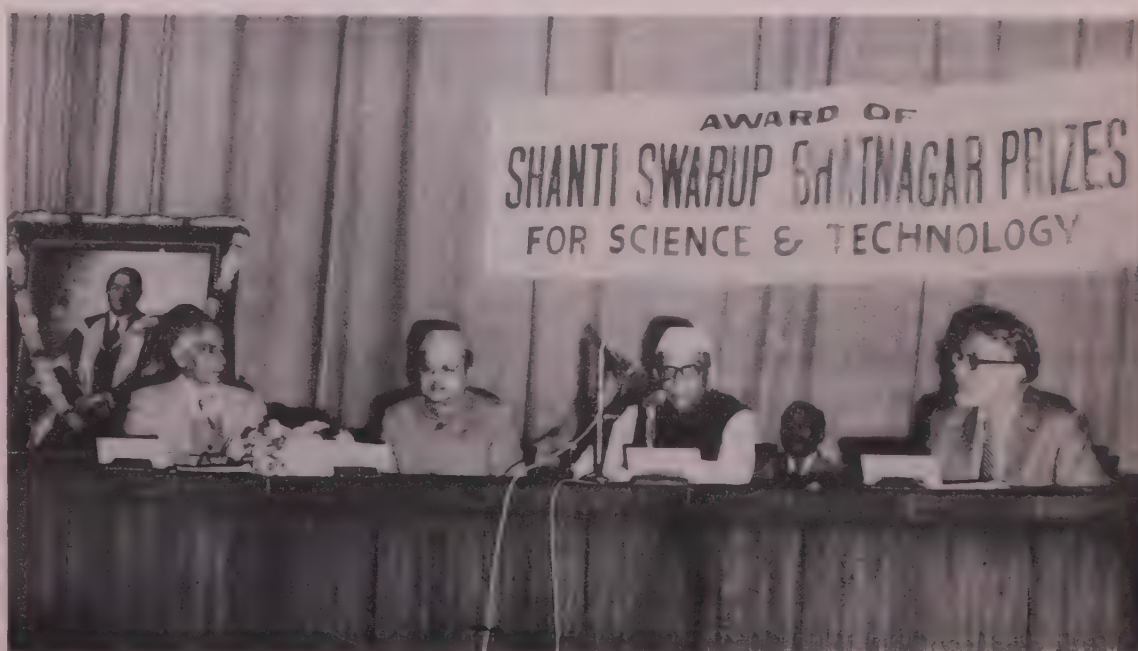
Prime Minister Presents Shanti Swarup Bhatnagar Prizes 1976-1977

Eighteen distinguished scientists were awarded the Shanti Swarup Bhatnagar Prizes for the years 1976 and 1977 at a function held at the National Physical Laboratory, New Delhi, on 8 February 1979. The Prime Minister of India, and President of the Council of Scientific & Industrial Research Shri Morarji Desai gave away the prizes. The Union Education Minister Dr P.C. Chunder, who is also the Vice President of CSIR, presided.

Of the prizewinning scientists, 16 were present to receive 'the highest and most coveted award amongst the scientists and technologists in India'.

In his address, the Prime Minister congratulated at the outset the award-winners*, and said that Indian scientists were among the best in the world and that they should not have any inferiority complex. The country had the capacity to contribute a lot in the field of science and technology. Stating that India had produced many eminent scientists right through ancient to modern times, the Prime Minister emphasized that these awards were not an incentive but a recognition of the scientists' outstanding work. In this context, Shri Desai defined real scientists as those who do outstanding work not for any incentive or rewards but for the sheer love of doing science and with the dedication and sole purpose of

*The Prime Minister made a touching reference to the late Dr Devaprabhakara and said "the country has lost a young scientist and we are therefore all sorry, and extend our sympathy to Smt Devaprabhakara."



The Prime Minister Shri Morarji Desai addressing the scientists after giving away the Shanti Swarup Bhatnagar Prizes. Others seated on the dais (from left): Dr A.R. Verma, NPL's Director; Dr Pratap Chandra Chunder Union Minister for Education and Social Welfare; and Prof. M.G.K. Menon, Director General, Scientific & Industrial Research

gaining more knowledge in the field of their endeavour. Not everyone who has a science degree is a scientist, he added. "One can be a scientist only if one devotes one's lifetime to science." But then he expressed his conviction that science is not the end: the real end is the happiness of man, and man's development to the highest stature he is capable of rising to. It is toward this end that all science should be directed.

The Prime Minister called upon scientists to consider how best science and technology can help the people to better their lives.

Shri Desai urged the organizations like CSIR to use the work of their scientists for practical benefit to the nation. Emphasizing the need for full

and proper utilization of the results of scientific researches, he stated emphatically that any good work done by scientists would get assistance from the government or other bodies.

The Prime Minister deprecated the use of science and technology, especially in the field of nuclear energy, for destructive purposes.

Inside

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Dr Pratap Chandra Chunder traced the history of Shanti Swarup Bhatnagar Prizes, and said that so far 118 scientists had been awarded the prize and that 66 of them had received joint awards. Making a brief mention of the current CSIR's R & D work, the CSIR Vice President pointed out that the Council's thrust was now on the application of science and technology to

SHANTI SWARUP BHATNAGAR PRIZEWINNERS 1976 and 1977

rural development and rural technology delivery systems. He added that the initiatives CSIR took in recent past* in these areas are being followed up by other organizations. The Minister expressed confidence that CSIR would contribute to the growth of a meaningful and powerful scientific capability in the country.

Professor M.G.K. Menon, Secretary, Department of Science and Technology, and Director General, Scientific & Industrial Research, read out the citations which are reproduced below:

*See CSIR Annual Report: 1972

CITATIONS

Prof. R. Vijayaraghavan

The Shanti Swarup Bhatnagar Prize in Physical Sciences for the year 1976 has been awarded to Dr R. Vijayaraghavan, Professor and Head, Solid State Physics & Materials Science Group, Tata Institute of Fundamental Research, Bombay, jointly with Prof. C.K. Majumdar, Palit Professor of Physics, Calcutta University, Calcutta.

Prof. Vijayaraghavan has made significant contributions to the study of metals and alloys through the nuclear magnetic resonance technique. Studies on the oscillatory character of conduction electron polarization in rare earth alloys, the Kondo-type behaviour in concentrated cerium alloys, and crystal field effects on the magnetism and the hyperfine fields in samarium alloys are well known. Prof. Vijayaraghavan and



Prof. R. Vijayaraghavan



Prof. C.K. Majumdar



Prof. D. Devaprabhakara



Dr Kishan Singh



Dr G P. Dutta



Prof. Rajinder Kumar



Prof. V. Rajaraman



Prof. N.R. Moudgal



Prof. K.R. Parthasarathy



Prof. S.K. Trehan



Dr M.K. Bose



Prof. K.S. Valdiya

his group are working on spin glasses, Heusler alloys, and other magnetic materials. [For details of Prof. Vijayaraghavan's work, see CN, 28 (1978), 158].

Prof. C.K. Majumdar

The Shanti Swarup Bhatnagar Prize in Physical Sciences for the year 1976 has been awarded to Prof. C.K. Majumdar, Palit Professor of Physics, Calcutta University, Calcutta, jointly with Dr R. Vijayaraghavan, Tata Institute of Fundamental Research, Bombay.

Prof. Majumdar has made valuable contributions to the study of problems of finite Heisenberg chains, critical parameters in phase transitions, and positron annihilation. Calculations of effective magnetic moment, specific heat and other physical quantities for finite Heisenberg chains are important. These calculations also showed the existence of the violation of the noncrossing and nondegeneracy rules. He has determined the critical parameters of ferromagnetic Ising model and gas-liquid transition.

His work on positron annihilation has provided a theoretical basis for the measurement of the Fermi momentum of metals. The study of bound magnon states by using techniques borrowed from scattering theory is new and enables one to compute bound magnon states. Such bound magnon states were verified experimentally.

Prof. D. Devaprabhakara *

The Shanti Swarup Bhatnagar Prize in Chemical Sciences for the year 1976 has been awarded to (late) Prof. D. Devaprabhakara, Department of Chemistry, Indian Institute of Technology, Kanpur.

Prof. Devaprabhakara has made significant contributions to alicyclic chemistry, especially cyclic allenes and medium-ring dienes. He has carried out in-depth studies on reduction, hydroboration and isomerization of these

*Smt Devaprabhakara received the prize on behalf of her husband (deceased).

substrates. He has also synthesized a number of highly strained and novel cyclic hydrocarbons. His work has not only led to rationalization of the reactions observed in these systems but has considerable predictive value. [For details of the late Prof. Devaprabhakara's prizewinning work, see *CN*, 29 (1979), 14].

Dr Kishan Singh

The Shanti Swarup Bhatnagar Prize in Biological Sciences for the year 1976 has been awarded to Dr Kishan Singh, Director, Indian Institute of Sugarcane Research, Lucknow, jointly with Dr G.P. Dutta, Central Drug Research Institute, Lucknow.

Dr Kishan Singh has made outstanding contributions to sugarcane pathology and has organized one of the most active teams in applied research in sugarcane cultivation in the country. His work in crop pathology covers a wide canvas, including viruses, mycoplasmas, fungi, and nematodes. Of special significance are his contributions to epidemiology and control of sugarcane diseases, association of mycoplasma with grassy shoot disease, and its control by hot-air therapy.

Dr G.P. Dutta

The Shanti Swarup Bhatnagar Prize in Biological Sciences for the year 1976 has been awarded to Dr G.P. Dutta of the Central Drug Research Institute, Lucknow, jointly with Dr Kishan Singh, Indian Institute of Sugarcane Research, Lucknow.

Dr Dutta has significantly contributed towards an understanding of the functional morphology of the various components of the protozoa and has developed new techniques for their culture. He has also elucidated the metabolic and growth responses of several microorganisms, including *Entamoeba histolytica*, to various physicochemical factors. Dr Dutta is an outstanding experimental protozoologist in the country. [For details of Dr Dutta's prizewinning work, see *CN*, 29 (1979), 6].

Prof. Rajinder Kumar

The Shanti Swarup Bhatnagar Prize in Engineering Sciences for the year 1976 has been awarded to Prof. Rajinder Kumar, Professor of Chemical Engineering, Indian Institute of Science, Bangalore, jointly with Prof. V. Rajaraman, Professor of Electrical Engineering and Computer Science, Indian Institute of Technology, Kanpur.

Prof. Kumar has made outstanding contributions in hydrodynamics and mass transfer in multiphase systems. The two-stage model of Kumar for bubble or drop formation is now widely used. Prof. Kumar has successfully utilized his basic research work in the design and operation of a large-scale fluidized-bed reactor for the manufacture of copper sulphate directly from chalcopyrites. [For details of Prof. Kumar's prizewinning work, see *CN*, 29 (1979), 5].

Prof. V. Rajaraman

The Shanti Swarup Bhatnagar Prize in Engineering Sciences for the year 1976 has been awarded to Prof. V. Rajaraman, Professor of Electrical Engineering & Computer Science, Indian Institute of Technology, Kanpur, jointly with Prof. Rajinder Kumar, Professor of Chemical Engineering, Indian Institute of Science, Bangalore.

Prof. Rajaraman is a pioneer in teaching and research, including application of the research in computer science in the country. His significant research work in decision tables is widely used. He has made a unique contribution in the application of the computers in real-time process control in industry, and, in particular, steel industry. [For details of Prof. Rajaraman's prizewinning work, see *CN*, 29 (1979), 4].

Prof. N.R. Moudgal

The Shanti Swarup Bhatnagar Prize in Medical Sciences for the year 1976 has been awarded to Prof. N.R. Moudgal, Department of Biochemistry, Indian Institute of Science, Bangalore.

Prof. Moudgal's work on the elucidation of gonadotropin action using immunological methods is of a pioneering nature. The unfolding of luteinizing hormone (LH) binding to its receptors in the target cell and the biochemical reactions elicited are of great significance in exploring the molecular mechanism of action of the hormone concerned. His studies on follicular maturation and the role of follicle stimulating hormone (FSH) and LH in this have been very elegantly carried out. The extensive work done by Prof. Moudgal's school on reproductive endocrinology based on his findings in experimental animals has provided a possible approach for devising fertility control processes by the passive immunization technique. [For details of Prof. Moudgal's prizewinning work, see *CN*, 28 (1978), 140].

Prof. K.R. Parthasarathy*

The Shanti Swarup Bhatnagar Prize in Mathematical Sciences for the year 1976 has been awarded to Prof. K.R. Parthasarathy, Indian Statistical Institute, New Delhi, jointly with Prof. S.K. Trehan, Panjab University, Chandigarh.

Prof. Parthasarathy has made outstanding contributions to the probability theory on locally compact groups. Working in collaboration with K. Schmidt, Prof. Parthasarathy has derived infinitely divisible projective representations, the Levy-Khinchine-Araki formula on locally compact groups, and limit theorems for uniformly infinitesimal families of positive definite kernels. His work has had a significant impact on theoretical quantum mechanics associated with Araki and Woods.

Prof. S.K. Trehan

The Shanti Swarup Bhatnagar Prize in Mathematical Sciences for the year 1976 has been awarded to Prof. S.K. Trehan, Department of Applied Mathematics, Panjab University,

*Absent



Prof. Mihir Chowdhury



Prof. S. Ranganathan



Dr T.C. Anand Kumar



Prof. M.S. Raghunathan



Dr K.L. Kaila



Dr Subir Kumar Ghosh

Chandigarh, jointly with Prof. K.R. Parthasarathy, Indian Statistical Institute, New Delhi.

Prof. Trehan has made significant contributions to the stability of force-free magnetic fields, of jets and cylinders, and of inhomogeneous plasmas. His recent work on the mathematical treatment of gaseous polytropes in the presence of a magnetic field could be a breakthrough in this important area. He has also made noteworthy contributions to the study of hydromagnetic waves and rotating gaseous masses. [For details of Prof. Trehan's prizewinning work, see *CN*, 28 (1978), 165].

Dr Mihir K. Bose

The Shanti Swarup Bhatnagar Prize in Earth Sciences for the year 1976 has been awarded to Dr Mihir K. Bose, Department of Geology, Presidency College, Calcutta, jointly with Dr K.S. Valdiya, Kumaun University, Nainital.

Dr Bose has made significant contributions to chemical petrology, particularly of alkaline rocks and anorthosites, in different geological environments in India. He has made innovative studies on rock-forming minerals derived from different chemical milieu under various pressure-temperature conditions. He has employed geochemical criteria for understanding the magmatic differentiation and for discriminating between different ultramafic rocks of Singhbhum. His contributions to the petrologic nomenclature and classification are internationally recognized. [For details of Dr Bose's prizewinning work, see *CN*, 28 (1978), 148].

Prof. K.S. Valdiya

The Shanti Swarup Bhatnagar Prize in Earth Sciences for the year 1976 has been awarded to Prof. K.S. Valdiya, Department of Geology, Kumaun University, Nainital, jointly with Dr Mihir K. Bose, Presidency College, Calcutta.

Prof. Valdiya has made notable contributions to Himalayan geology through a sustained and comprehensive study of the Kumaun Himalaya. He has carried out a pioneering study of the algal stromatolites in the Lesser Himalaya leading to the fixation of the age of an important rock formation. He has also carried out systematic investigations on economically rich magnesite deposits, and lithological and palaeocurrent studies of its flysch sediments. His researches have contributed significantly to the tectonic synthesis and evolutionary history of this part of the Himalayas. [For details of Prof. Valdiya's prizewinning work, see *CN*, 28 (1978), 157].

Prof. Mihir Chowdhury

The Shanti Swarup Bhatnagar Prize in Chemical Sciences for the year 1977 has been awarded to Prof. Mihir Chowdhury, Indian Association for the Cultivation of Science, Calcutta, jointly with

Prof. S. Ranganathan, Department of Chemistry, Indian Institute of Technology, Kanpur.

Prof. Chowdhury has made significant contributions to the understanding of electronic structure of molecules through optical, magneto-optical and quantum mechanical methods. He has fabricated sophisticated experimental facilities for spectroscopic and fast kinetic studies. His studies on single crystal spectra throw light on spin-forbidden crystal-field bands in transition metal complexes, exciton transitions in bimolecules, charge-transfer transitions in diazines and parity-forbidden transitions in rare earth complexes. Prof. Chowdhury's studies on circular dichroism/optical rotatory dispersion/molecular circular dichroism/molecular optical rotary dispersion/Zee-man effect of rare-earth complexes and his recent physicochemical studies with lasers are noteworthy.

Prof. S. Ranganathan

The Shanti Swarup Bhatnagar Prize in Chemical Sciences for the year 1977 has been awarded to Prof. S. Ranganathan, Department of Chemistry, Indian Institute of Technology, Kanpur, jointly with Prof. Mihir Chowdhury, Indian Association for the Cultivation of Science, Calcutta.

Prof. Ranganathan has made valuable contributions to synthetic and mechanistic organic chemistry. He has devised novel routes to prostaglandins, an important group of biologically active compounds. He has studied several interesting reactions involving bond reorganizations and put forward a convincing rationalization for them. Those involving bridged bicyclic systems deserve special mention.

Dr T.C. Anand Kumar

The Shanti Swarup Bhatnagar Prize in Biological Sciences for the year 1977 has been awarded to Dr T.C. Anand Kumar, Associate Professor, Department of Anatomy, All India Institute of Medical Sciences, New Delhi.

Dr Anand Kumar has made outstanding contributions in neuro-endocrinology of primate reproduction and has demonstrated the presence of gonadal hormones in the cerebrospinal fluid (csf) and their transport to the brain. His work on fertility regulation, especially the administration of contraceptive steroids through the nasal route which results in their preferential transfer into the csf, is of particular significance in developing newer approaches to contraception. [For details of Dr Anand Kumar's prizewinning work, see *CN*, 29 (1979), 19].

Prof. M.S. Raghunathan

The Shanti Swarup Bhatnagar Prize in Mathematical Sciences for the year 1977 has been awarded to Prof. M.S. Raghunathan, Tata Institute of Fundamental Research, Bombay.

Prof. Raghunathan is one of the outstanding mathematicians who have been responsible in the past decade for advancements in the area of Lie groups, particularly discrete subgroups. In his earlier work he had proved for the first time the rigidity of 'non-uniform' arithmetic lattices connected with Selberg's conjecture. Later, he solved, in essence, Selberg's conjecture for non-uniform lattices before the complete solution of the conjecture was worked out by G.A. Margulis.

In his recent work, he has made significant contributions to Serre's conjecture on 'Congruence Subgroup Problem' and generalizations of Quillen's solution of Serre's problem on vector bundles on the affine space.

Dr K.L. Kaila

The Shanti Swarup Bhatnagar Prize in Earth Sciences for the year 1977 has been awarded to Dr K.L. Kaila of the National Geophysical Research Institute, Hyderabad, jointly with Dr Subir Kumar Ghosh, Jadavpur University, Calcutta.

Dr Kaila has contributed significantly to the development of deep seismic sounding (DSS) technique for the first time in India. He was responsible for the technical organization and management of this ambitious project. The DSS profiles in India with which he was concerned were laid in a variety of geological environments—such as Cuddapahs and Dharwars in South India, the Deccan Traps in Maharashtra, the sedimentary basins in Gujarat and the Himalayas in the north. Dr Kaila interpreted the DSS data in terms of the geological setting of the areas concerned and brought to light the surface manifestations of the deep-seated structures.

Dr Subir Kumar Ghosh

The Shanti Swarup Bhatnagar Prize in Earth Sciences for the year 1977 has been awarded to Dr Subir Kumar Ghosh, Reader in Geology, Jadavpur University, Calcutta, jointly with Dr K.L. Kaila, Scientist, National Geophysical Research Institute, Hyderabad.

Dr Ghosh has made significant contributions in the field of theoretical and experimental structural geology. Through ingeniously designed experiments, he established the geometrical relationships of the axial surfaces of folds with the principal planes of deformation and elucidated the different types of fold interferences. He carefully analyzed the variation of strains in superposed folds and has explained the mechanism of rotation of early lineations by later folding. Dr Ghosh has developed a theory on the fundamental aspects of conglomerate deformation by utilizing the principles of deformation of non-homogeneous materials. His analysis of the mechanism of distortion of planar structures around rigid bodies is of great significance in structural geology.

Electronic Weighing Systems

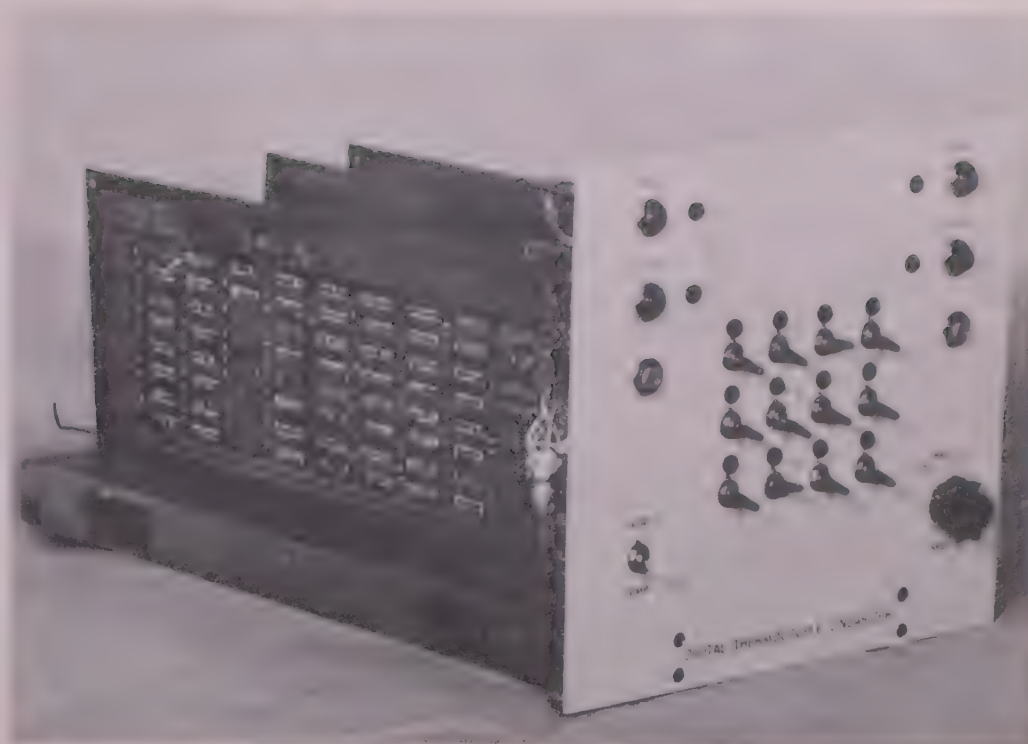
Symposium at NAL

A symposium on Electronic Weighing Systems organized by the National Aeronautical Laboratory (NAL), Bangalore, during 7-8 December 1978 provided a forum for discussing the state-of-art, R & D activities, standards procedures, legal metrology and other associated matters in the fast-emerging electronic weighing in industries.

Inaugurating the symposium, Shri K.P.P. Nambiar, Managing Director, Kerala State Electronics Development Corporation (KELTRON), Trivandrum, stressed the need to promote the manufacture of electronic goods for which indigenous technology had been successfully developed. He said that KELTRON produced four-crore rupees worth of electronics equipment last year, using indigenous technology. Shri C.S. Rangan, head of the NAL's Systems Engineering Division, which organized the symposium, underlined its importance.

The symposium, attended by more than 100 delegates, including users and manufacturers of electronic weighing systems, was spread over three technical sessions covering basic sensors, signal processors, and total systems, followed by panel discussions. Twenty scientific and technical papers were presented.

Some of the important recommendations made at the symposium relate to: Establishment of primary calibration facilities for up to 100 tonnes of weighing; Preparation of standards documents outlining grades of accuracies and calibration procedures; Legalizing the electronic weighing systems for material weighing; and Enhancement of current R & D activities for inducting the latest technology in electronic weighing.



Prototype of the digital thermocouple linearizer developed by NAL, Bangalore

Digital Thermocouple Linearizer

The output emf of a thermocouple at different temperature ranges is not linear with respect to temperature. It is often necessary in such cases as on-line temperature measurements in aerodynamic applications (e.g. wind tunnel instrumentation, on-board measurement of critical temperatures in fighter aircrafts, etc.) to linearize the output for very accurate results and to express it in engineering units ($^{\circ}\text{C}$ or $^{\circ}\text{F}$).

Until very recently, a few common methods of linearization, such as segmentation technique and analogue technique, were being tried at the National Aeronautical Laboratory (NAL), Bangalore. But the linearization of the digitized output of a thermocouple has been virtually nil in the systems developed so far by the laboratory.

The NAL's Systems Engineering Division has now developed a digital thermocouple linearizer for 'K' type (Chromel-Alumel) thermocouple sensors. This linearizer employs a hardware implementation for linearizing the digitized output. As such types of linearizers are not available in India,

NAL's development will bridge the gap in instrumentation technique for temperature measurement by the use of thermocouples. A prototype model of the linearizer which uses a random access memory (RAM) is shown in the figure (above).

The low-level output of a thermocouple is normally amplified by using a high-gain instrumentation amplifier and the output is digitized to binary coded decimal (BCD) form by the use of a digital panel meter (DPM). The output of the DPM is stored into the memory address register (MAR) of the digital thermocouple linearizer. The actual temperatures corresponding to the respective outputs in millivolts of the specified thermocouple are stored in successive locations of a 'Read Only Memory' from location 000. The amplifier gain and the DPM settings are adjusted in such a way that the contents of the DPM once loaded into the MAR form directly the address of the location in RAM containing the actual temperature reading. This temperature is read into the memory display register (MDR) for display. Alternatively, the output, which is in BCD form, could be directly coupled to any other on-line control system.

Suppose, for example, corresponding to 100°C the emf output of a K-type thermocouple is 4.095 mV. This is amplified by the proper gain of the amplifier and connected to DPM input. If the amplifier gain in this case is set (say) to 25, DPM output will be 102.4 mV. The integral part of this BCD output of DPM fed to the MAR forms the required address. Location 102 will contain the number 100 which is the actual temperature measured corresponding to the thermocouple output of 4.095 mV.

A modified version of this linearizer is being developed. It has been designed in a modular form of standard rack size so that it can be plugged directly into a temperature-measuring system.

The specifications of the digital thermocouple linearizer are:

Range	: 0°-1000°C
Conformity error	: $\pm 1^\circ\text{C}$
Resolution	: 1°C
Power supply	: 5 V, 2 A

Deputation Briefs

Prof. S. K. Basu, Director, Central Mechanical Engineering Research Institute, Durgapur, visited leading technological universities and laboratories in the Federal Republic of Germany, under the CSIR-DAAD exchange programme, in September 1978. Prof. Basu acquainted himself with the latest trends of research work done in tribology.

Based on his experience and observations Prof. Basu has suggested, in his deputation report, that bilateral collaboration between India and West Germany could be initiated in the following areas: Evaluation and testing of polymers; Surface fatigue of machine elements, and measurement of residual stresses; Testing of ball and roller bearings and performance evaluation and development of lubricants, including solid lubricants and greases; Friction and wear analysis of materials (conventional and unconventional); Abrasive wear of materials and measurement of wear by ferrography

and radioisotope technique; and Metal cutting in the field of noise elimination, and adaptive control system in grinding, and economic evaluation of various machining processes including ultrasonic machining.

PROGRESS REPORTS

NGRI Annual Report: 1977-78

The R & D activities of the National Geophysical Research Institute (NGRI), Hyderabad, were spread over 37 projects grouped under four broad areas, viz. mineral exploration; groundwater exploration and aquifer simulation; deep seismic sounding; and integrated studies in Peninsular shield and Himalaya, geothermics and observatories. Against a total financial input of Rs 14.569 million, the laboratory's earnings aggregated to Rs 4.314 million. These statistics for 1977-78 are revealed by the laboratory's annual report for the period.

By employing the airborne geophysical survey facility developed at NGRI, aeromagnetic surveys were carried out in Garo, Khasi and Jaintia Hill districts of Assam-Meghalaya (24,000 km²) on request from the North-Eastern Council, and in eastern Brahmaputra Valley (8900 km²) and Mahanadi Basin (32,250 km²) for Oil India Ltd. A rubidium vapour magnetometer mounted on the tail boom of a Dakota DC-3 aircraft was used for the survey.

A digital data logger, designed and developed earlier, was fabricated and used for recording airborne geophysical data during surveys in Assam-Meghalaya. Specific programmes have been employed for mechanical retrieval of data and machine-processing of the data using PDP 11/40 computer and programmable calculator HP 9830 B.

Efforts have been made to develop techniques to compute the electrical, em and IP responses of two/three-dimensional bodies embedded in conducting rocks. Generalized field schemes have been proposed for resistivity

sounding, independent of bipolar or dipolar activation of current sources. These may find use in groundwater surveys, deep crustal investigations and geothermal exploration. Laboratory IP and resistivity modelling studies were continued. A laboratory model for induction logging of boreholes was designed.

Experimental surveys for bauxite prospecting at Amarkantak (Madhya Pradesh) were undertaken at the request of Bharat Aluminium Ltd.

In view of the significance of tensile strength of rocks in mining operations, formulae relating failure-load to tensile strength were studied. The 'finite element method' was employed to study the behaviour of anisotropic rocks. Statistical studies were undertaken for a probabilistic appraisal of mineral exploration prospects, and resources at the Kolar Gold Fields were estimated.

A direct reading proton magnetometer designed earlier was fabricated. The instrument has a signal generator of a novel type in which the use of mechanical relays is avoided.

Extensive geophysical exploration for groundwater has been undertaken on behalf of private/public sector undertakings, state governments and Central Groundwater Board in Andhra Pradesh, and Goa, Daman and Diu. Integrated geophysical/geohydrological studies in Lower Maner Basin were continued under pilot basin programme. Tracer studies using tritium (natural) were undertaken in Vedavathi River Basin.

Aquifer simulation techniques have been further refined through digital and RC analog models of selected river basins. The following portions of river basins have been studied: Krishna-Hindon interstream region in Uttar Pradesh, Tallaguda-Palmokul Basin in Andhra Pradesh and Dudhi-Shakkar sub-basin of Narmada Valley in Madhya Pradesh.

The phreatic aquifers of Lower Maner Basin are being studied as two separate sub-basins demarcated on hydrogeological considerations. Digital simulation tests were continued in both

steady and nonsteady states of equilibrium.

Deep seismic soundings (DSS) carried out earlier along Kavali-Udipi (600 km long) profile and the analyses of the data collected have led to a consolidated depth cross-section of the crust down to 50-60 km. DSS studies in Koyna area have revealed interesting features. DSS data have been obtained along another 200 km long Kelsi Loni profile (parallel to the existing Guhagar Jath profile) in the area. These data are being processed.

In the Cambay basin (Navasari-Mehmedabad 200 km long profile), a preliminary depth cross-section was prepared solely with the refraction data. It has revealed the presence of a layered structure throughout the cross-section and various deep faults cutting the layered crust from surface down to the sub-moho regions. In Saurashtra (Navibandar-Amreli 160 km long profile) the analysis of DSS data using a detailed velocity function has led to a depth section down to 50-60 km.

Computerized methods have been developed to ascertain effective velocities suitable to the depth of reflector by the use of direct/reversed reflection travel time curves from two reciprocal DSS shot points.

Studies on upper mantle structure travel-time curves for the Indian sub-continent and regional seismicity were pursued. A seismic risk map of India was prepared.

The seismicity of geothermal provinces is being studied by employing surface-waves analyses techniques. Investigations on earthquake prediction were started in well-known seismically active regions of Assam.

Investigations on source parameters of a number of earthquakes of the Himalayan region revealed a linear relationship between seismic moment and magnitude m_b . A higher stress association was indicated for earthquake occurrences in Himalaya.

Some characteristics in temperature-depth curves have been identified in exploratory boreholes of Parbati Valley (Himachal Pradesh) logged during the

period. Geothermal studies in Tural-Rajwadi and Unhavare (Khed) hot spring areas of Konkan coast indicated the flow direction of hot water as N-S in Tural, E-W in Rajwadi and E-SW in Unhavare.

Studies were pursued on mapping the structural discontinuities by varying the frequency of em waves under different simulated field situations.

The laboratory published the gravity anomaly maps of India. The series consists of five maps showing distribution of gravity stations (GPH/1), Bouguer (GPH/2), Isostatic (GPH/3), Free-air (GPH/4) and Bouguer Gravity Anomaly superimposed on regional geology map (GPH/5).

Structural, geological, geochemical, mechanical (under pressure) and paleomagnetic studies on rocks from the Himalaya and the Peninsular Shield were continued. Integrated geological, geophysical and geochemical studies were carried out in selected parts of the Peninsula with a view to establishing the stratigraphic sequence of the Dharwars and understanding the evolution of the Peninsular crust vis-a-vis their mineralization.

Thirty-six research papers were published and 19 technical reports were released during the period.

PERSONNEL NEWS

Appointments/Promotions

Shri K. S. Sarma

Shri K.S. Sarma of the Optics Division of the National Physical Laboratory (NPL), New Delhi, has been promoted, on assessment, to the position of Scientist EI with effect from 1 July 1977.

Shri Sarma (born 5 June 1926), started his research career at NPL as a Junior Scientific Assistant (24 Oct. 1949). Deputed in 1952 by NPL as a research fellow under the Colombo Plan to Australia for advanced training and research in photometry and colorimetry, Shri Sarma worked at the

National Standards Laboratory, Sydney, on photometric and colorimetric standards; at the Sydney Country Council Photometric Laboratories on street lighting techniques; and at the Electric Lamp Manufacturers' Association of Australia, New Castle, on lamp manufacture and quality control techniques.

Returning to India in December 1954, Shri Sarma established the photometry laboratory at NPL which maintains the national standards of light and is equipped with a full range of facilities for testing lamps, lighting fittings, etc. A consultant to many lamp and luminaire industries, Shri Sarma has organized quality-control laboratories for several of them.

Shri Sarma is convener and member of a number of committees of the Indian Standards Institution for setting up various standards specifications for the lighting industry; is secretary of the Illumination Engineering Society of India; and is an elected (Indian) Associate of the International Commission on Illumination (CIE), Paris. Attended the CIE Congress (London, 1975) as a delegate from India.

Shri Baldev Singh

Shri Baldev Singh, Chief Technology Utilization, CSIR, New Delhi, will continue till the end of September 1979 as the Regional Adviser for the United Nations Conference on Science & Technology at Bangkok under the Economic & Social Commission for Asia and the Pacific (ESCAP).

Obituary

Prof. Mata Prasad

With deep regret, CN records the passing away of Prof. Mata Prasad, 81, the first Director of the Central Salt & Marine Chemicals Research Institute, Bhavnagar, on 27 January 1979. Dr Mata Prasad was Professor, Principal and the first Director of the Institute of

Science, Bombay, where he spent 28 years of his research and teaching career. He was the founder Vice Chancellor of the Vikram University, Ujjain.

Prof. Mata Prasad's main fields of study were colloid chemistry, magneto-chemistry, X-ray crystallography, and industrial chemistry, in which he published more than 200 papers.

Prof. Mata Prasad was a life Fellow of the Royal Institute of Chemistry, London. He presided over the Chemistry Section of the Indian Science Congress held at Banaras in 1942; he was also president of Indian Chemical Society, Institution of Chemists, and other scientific bodies.

CONFERENCE ANNOUNCEMENTS

Fracture Mechanics in Engineering Application: NAL

An international conference on fracture Mechanics in Engineering Application, jointly organized by the National Aeronautical Laboratory (NAL), Bangalore, and the Lehigh University, Pennsylvania, USA, will be held at NAL from 26 to 30 March 1979. Papers will be presented on the following topics: Aircraft structures; Analytical modelling of failure; Bioengineering; Characterization of low-cost materials; Composite materials and structures; Damage tolerance design concepts; Dynamic crack propagation; Earthquake-related problems; Environmental effects; Experimental stress and strain analyses; Fail safe analyses; Failure criteria; Fatigue crack propagation; Finite elements and numerical analyses; Fracture toughness testing; Joints and mountings; Microstructure and metallurgical effects; Non-destructive testing methods; Pressure vessels, piping and components; Reliability; Rotating machinery; Ship structures; Soil and structure interaction; and Welded structural components. The conference papers are expected to be published in book form.

For further details, write to: the Director, National Aeronautical Laboratory, Post Bag No. 1779, Bangalore 560017.

PATENTS FILED

779/Del/78: An improved process for the production of pure *o*-chlorophenol and *p*-chlorophenol, S. Husain, P.A. Swaroop, M.A.K. Akmal, M. Kifayatullah & R. Vaidyeswaran—RRL, Hyderabad.

793/Del/78: Improvements in or relating to the preparation and sintering of manganous zinc ferrous ferrites, M.N.S. Murthy, C.E. Deshpande, P.P. Bakare & J.J. Shrotri—NCL, Pune.

794/Del/78: Diaphragm pump, H.J. Patel—NEERI, Nagpur.

813/Del/78: An efficient device for removing airborne fine dust particles from ambient air, P.C. Mehendru, K.K. Jain, V.S. Panwar, Satbir Singh & R.C. Bhatheja—NPL, New Delhi.

843/Del/78: Process for the preparation of 2,5-dichlorophenol, S. Husain, P.A. Swaroop, M. Kifayatulla, R. Narsimha & R. Vaidyeswaran—RRL, Hyderabad.

844/Del/78: Improved process for the preparation of zinc phosphate using zinc carbonate, H.V.K. Udupa, K.V. Narasimham, S.N. Guruviah, V.

Chandrasekaran & P.S. Gomathi—CECRI, Karaikudi.

845/Del/78: Process for the preparation of 2,4,5-trichlorophenol, S. Husain, P.A. Swaroop, M. Kifayatulla, R. Narsimha & R. Vaidyeswaran—RRL, Hyderabad.

771/Del/78: A simple process for the production of spermicidal saponins from the fruits of *Sapindus* species, commonly known as soapnut, H.S. Garg, B.S. Setty, V.P. Kamboj & N.M. Khanna—CDRI, Lucknow.

721/Del/78: Improvements in or relating to chemical colour of aluminium and its alloys, B.A. Sheno, S. John & A. Perumal—CECRI, Karaikudi.

754/Del/78: Improvements in or relating to preparation of labels, designs and photographs of light-fast nature on anodized aluminium without silver by electric pigmentation, B.A. Sheno, V. Balasubramaniam—CECRI, Karaikudi.

PATENTS SEALED

Correction

In CN, 28 (1978), 191, under 2327/Cal/74 (142650): Pencil-type coating thickness gauge, S. Jain & B.C. Adhikari, please read the name of the laboratory as CMERI, Durgapur, instead of CMRS, Dhanbad.

FORM IV

(See Rule 8)

Statement about ownership and other particulars as required by clause 19-D of the Press and Registration of Books Act.

1. Place of publication:
2. Periodicity of its publication:
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6. Names and addresses of individuals who own the newspaper and partners or shareholders holding more than one per cent of the total capital.

I, Y.R. Chadha, hereby declare that the particulars given above are true to the best of my knowledge and belief.

15 March 1979

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Marine Algae in the Indian Ocean Region Symposium at CSMCRI

Considered as biological curiosities till just three decades ago, algae, especially marine algae, have met their role in the space age as an alternative source of food, feed and energy, as well as of chemicals and antibiotics. This multi-utility role of algae was well reflected in the deliberations at the recent International Symposium on Marine Algae of the Indian Ocean Region, sponsored by the Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, and co-sponsored by Unesco and the Department of Science and Technology (DST). The symposium, held at Bhavnagar during 9-12 January 1979, was inaugurated by Shri Navalbhai Shah, Gujarat's education minister. Professor M.G.K. Menon, Director General, Scientific & Industrial Research, and Secretary, DST, presided.

About 150 delegates from Indonesia, Japan, Norway, Saudi Arabia, Sweden, UK, USA, and West Germany, besides India, attended the symposium.

Welcoming the participants, Dr D.J. Mehta, CSMCRI's director, expressed the view that an international training centre on marine algae should be organized in India to impart short- or long-term training to researchers, scientists, and teachers in the countries of the Indian Ocean Region on different aspects of marine algae.

Shri Navalbhai Shah, in his inaugural speech, called upon the new Bhavnagar University to take advantage of the pioneer laboratory at Bhavnagar and start courses in marine biology, marine chemistry, fisheries technology and

courses on such other disciplines or areas as have multiple utilization potential in medicine, fuel, fertilizers and chemicals.

In his presidential address, Professor M.G.K. Menon laid accent on judicious exploitation of oceanic wealth so that the country does not run out of it fast. Professor Menon expressed that in the Indian context, marine algae, next to solar energy, perhaps could be a dependable source of energy. If a proposal for the establishment of an international training centre in marine algae was sent to CSIR and DST, it could be favourably considered in the larger interests of the Indian Ocean Region, he added.

On behalf of Unesco, Dr (Mrs) M. Vannucci, Programme Specialist in Basic Sciences, Unesco Regional Office for Science and Technology for South-Central Asia, said that more research and experimentation was needed to improve the usefulness of algae. She further stated that Unesco was paying special attention to the near-shore and coastal oceanic environment under its programmes.

Given below is a report of the technical sessions prepared by Shri K. Satyanarayana (Sr), *Indian Journal of Marine Science's* editor, who was the Publications & Information Directorate's official participant at the symposium:

Nearly 80 papers* on different facets

*Abstracts of the symposium papers (76) were brought out in book (Pp. 66) form (18.5 x 24.5 cm) by CSMCRI.

of marine algal research were presented by national and international participants. Besides, special lectures were delivered on topics of interest like 'Sulphated polysaccharides of Phaeophyceae'; 'Antibiotics from algae'; and 'Biofertilizers from algae'.

Survey, distribution, ecology and taxonomy of marine algae formed the subject of the first session. Algae from the Indian seas and the Red Sea and the coasts of Karachi, Kenya, Tanzania and Thailand were reported. Published records of Indian Ocean algae date back to 1768 with the issuing of N.L. Burman's *Flora indica* and S.G. Gmelin's *Historia fucorum*, but as pointed out by Prof. George F. Papenfuss of the University of California (USA), our knowledge of algae of most of the Indian Ocean is still very rudimentary. He recommended that work on algal flora of this large ocean should be taken up.

Aspects of photosynthesis, growth, morphology and cultivation of algae were covered in the second technical session. *Gelidiella acerosa*, an important agar-yielding alga, formed the central theme of studies on growth, nutritional requirements, field cultivation and harvesting. Work on this alga was presented by the CSMCRI scientists.

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Seaweeds form basic raw material for: (i) agar-agar (from species of *Gelidiella*, *Gracilaria*, *Gigartina*), (ii) alginates (*Sargassum*), and (iii) carrageenan (water-extractable galactan sulphuric acid esters of certain species of red seaweeds) (*Hypnea*). In addition to these, the occurrence of sphingosine, an amino alcohol, from *Caulerpa racemosa*, guanidino compounds from species of red algae, phlorotannins of fuhadol type from *Sargassum* spp., and diterpenoids, sterols and major metabolites like proteins, carbohydrates and lipids from other algae was reported in the third session.

The fourth technical session included reports of work on antibacterial, antifungal and pharmacologically active substances from marine algae. The inhibitory activity of extracts of *Enteromorpha*, an edible seaweed, on clinical isolates of *Mycobacterium tuberculosis*, appears significant. Seaweeds as feed for white leghorn chick was also discussed.

An interesting area of work covered in the fifth session was seaweeds as a source of energy, for biogas production employing microbial digestion, as liquid fertilizers, and as substrates for microbial growth.

Utilization of marine algae for improving coastal areas and uplift of rural economy were the topics of the sixth session. The areas of research to be promoted in the immediate future like genetics and breeding of seaweeds, methods of abstracting energy and chemicals (bulk as well as fine) and seaweed meal as a source of minerals and vitamins for domestic animals were highlighted in a paper on seaweed research in the 1980s. This paper (Arne Jensen, Institute of Marine Biochemistry, University of Trondheim, Norway) also stressed that research in the eighties should aim at bridging the gap between our growing ability to cultivate seaweeds and lack of suitably developed plants for growth.

Based on the addresses during the inaugural session, presentation of papers and discussions during the

technical sessions, the following observations/resolutions/recommendations were made*

Prof. George F. Papenfuss of the Department of Botany, University of California, Berkeley, California (USA), made a recommendation for providing special funds for developing herbarium facilities at research laboratories and also for field work and for overseas travel to enable researchers to study authentic specimens. Prof. Papenfuss further stressed the need to form an International Indian Ocean Marine Algal Committee for promoting cooperation among scientists engaged in research on marine plants; such a committee could organize multidisciplinary symposia like the present one once in four or five years, as also advanced training courses for young scientists.

Recognizing that Japan is one of the leading countries in marine algal cultivation and utilization, the meeting recommended that closer cooperation should be sought from Japan for improving the quality of marine algal research in the region.

Both the recommendations were unanimously accepted for implementation by the organizing committee.

Placing on record the exceptionally high scientific value of the symposium the delegates expressed the opinion that there was need for coordinating R&D programmes on marine algae with respect to the entire Indian Ocean Region for the benefit of the people of the area in general, and coastal and rural population in particular.

The symposium also stressed the need for establishing an international training centre in marine algae in collaboration with national and international agencies for the benefit of scientists and teachers as well as of personnel from industry in the Indian Ocean Region.

The symposium called upon the Department of Science and Technology, Council of Scientific and Industrial Research; and Unesco, FAO, UNIDO, WHO and other UN agencies to explore the possibilities of establishing an international training centre for marine algae in India.

Tanners' Get-together at CLRI

The fourteenth tanners' get-together held under the auspices of the Central Leather Research Institute (CLRI), Madras, during 1-4 February 1979, was a significant occasion in the laboratory's annual Leather Week (31 Jan. to 6 Feb. 1979).

The get-together's main theme—Economics of Indian leather and leatherware industries—evoked considerable interest from the industry, trade and concerned institutions and state agencies, and more than 500 delegates including 20 delegates from 11 foreign countries attended the get-together. A group of more than 100 footwear fabricators from France visited CLRI and went round the International Leather Fair organized during the

Leather Week. Practical problems of the trade and industry were discussed in four technical sessions dealing with: (i) Raw materials and infrastructure, (ii) Economics of processing, (iii) Marketing and state policies, and (iv) Views forum and summing-up session. Forty-nine papers dealing with diverse aspects of leather and leatherware industries were received from the participants. In the Tanners' Meet, three expert committees constituted by the laboratory discussed the issues raised in the get-together and brought out workable suggestions for promoting the industry. Three special lectures were delivered by three foreign participants. As a part of the get-together, practical demonstrations of know-how were given in the laboratory's tannery. A novel item introduced this year was the

*Based on material supplied by CSMCRI

demonstration of the techniques of grading and classification of semitanned and finished leathers by expert sorters and entrepreneurs drawn from the industry.

Under the guidance of Dr N. Ramanathan, CLRI's Acting Director*, Shri N. Lakshminarayanan and Shri M.S. Olivannan acted as conveners of the get-together.

RECOMMENDATIONS

The get-together made the following recommendations in three broad areas:

1. Raw Materials and infrastructure

The existing policy on the export of live animals should be reconsidered with a view to completely banning their export.

Government policy should encourage rearing goat on an intensive scale through stall feeding and similar methods so as to augment the supply of meat, which is in short supply, and of good quality goat skin.

Steps to modernize existing slaughter houses and to organize newer ones in the viable centres, including the rural areas, for ensuring availability of better quality raw hides and skins, meat and various other byproducts may be taken up.

Production and processing of exotic types of skins from fur-bearing animals should receive serious attention in Himachal Pradesh, Jammu and Kashmir, Sikkim and a part of Uttar Pradesh, all of which have a favourable climate.

Collection and rearing of young stock of cattle and buffalo needs immediate attention by promoting young stock farms because of the colossal loss of such animals due to neglect.

An All-India techno-economic survey on the production and marketing of raw hides and skins may be undertaken in order to fill the gaps of information on different aspects of production, marketing, wastage, preservation, etc.

*Dr Ramanathan's biodata to be received from CLRI for publication in CN.



Shri P. Ramachandran, Union Minister for Energy, inaugurating the International Leather Fair at CLRI on 31 January 1979. Seated on the dais are (from left) Dr V.S. Padmanabhan, Scientist in charge, Information, CLRI; Shri N. Lakshminarayanan, one of the conveners of the Tanners' Get-together; Dr N. Ramanathan, Acting Director, CLRI; Shri A. Nagappan, President, Indian Leather Fair Society, Madras; Shri Rama Prasada Rao, Chief Justice of Tamil Nadu; Shri K. Narayanaswamy Mudaliar, Tamil Nadu Minister for Law; Shri Hashim, Deputy Chairman, Leather Export Promotion Council, Madras; and Shri Sanjoy Sen, Chairman, Finished Leather Export Promotion Council, Kanpur.

Prevailing import duties on vegetable tanning materials and chrome salts may be rationalized and fixed at 40% on f.o.b. value.

Import of vegetable and wet blue hides and skins may be brought under OGL, free of duty, to augment the supply of raw materials for which there is an acute shortage at present.

Systematic studies on the demand and supply and trade policies of all types of tanning materials, leather auxiliaries and machines are necessary to evolve programmes for their production within the country.

A training programme in the operation and maintenance of different machines should be organized for the benefit of the industry.

The bottlenecks faced by the existing tanneries in getting funds from banks and other financial institutions while setting up treatment plants should be eliminated.

The leather industry has reached a stage where the need for professional managers is acutely felt. Short-term

training programmes should be arranged for industry's management representatives. CLRI, in collaboration with management institutions, may undertake this programme.

2. Economics of processing

Liberal import (with reduced duty) of the basic chemicals or components needed for the manufacture of leather auxiliaries may be allowed without detriment to the growth of indigenous industries.

A study of the capacity utilization of the existing tanneries and newly licensed ones is essential to evaluate their efficiency and prevent further growth of uneconomic units.

Service facility centres should be established, preferably by technocrats, at those locations where there is a concentration of the industry.

3. Marketing: Government policies

Marketing studies and dissemination of information regarding the prices prevailing in international markets, type

and quantity of various leathers in demand, etc. and updating of technological know-how in keeping with the developments abroad are necessary.

An Asian Regional Fashion Council to develop fashion designs for leatherware for export market should be set up under ESCAP's auspices.

Regional cooperation among developing countries in respect of raw materials and other expertise, in order to strengthen the bargaining position of these countries in their trade with developed countries, should be brought about.

The non-IATA charter airlines and foreign airlines should be allowed to lift cargo from Madras. (At the moment, foreign airlines lift cargo from Bombay). This action will eliminate the backlog of cargo of finished leathers in the Madras airport.

NCL Processes for Ethephon and Dimethoate Demonstrated

Processes relating to the manufacture of agricultural chemicals Dimethoate and Ethephon, both developed by the National Chemical Laboratory (NCL), Pune, were recently demonstrated to parties.

Dimethoate: The process for the manufacture of Dimethoate was demonstrated to the representative of MICO Farm Chemicals Ltd, Madras—the second party to receive demonstration on Dimethoate at NCL.

Dimethoate is widely used in India and is effective in the control of a wide range of insects and mites on many vegetables, wheat, sorghum, cotton, apples, pears, safflowers, lemon, oranges, grape fruits, ornamental plants, etc. It has low toxicity to man and warm-blooded animals.

Ethephon: The process for the manufacture of Ethephon was demonstrated to the representatives of Johar and Satya Chemicals P. Ltd, Bangalore, and to the representative of Mascot Chemical

Works, Bangalore (consultancy engineers for the firm). This is the first party to acquire this process for commercial exploitation.

Ethephon is an important plant growth regulator capable of varied applications. Its application leads to 200-300% increase in rubber latex yields. It can change the female-male flower ratio and eventually lead to higher fruit yields. It is also used for maturing and ripening fruits. Besides, Ethephon has the property of facilitating abscission of fruits and defoliation which help mechanical harvesting.

Ethephon is not manufactured in India.

Deputation Briefs

Dr L.P. Pandey of the National Metallurgical Laboratory (NML), Jamshedpur, visited Czechoslovakia from 5 October to 13 November 1978 under the exchange of scientists programme between the Council of Scientific & Industrial Research and the Czechoslovak Academy of Sciences. Pandey visited the universities of chemical technology in Prague and Pardubice; Charles University; Geological Survey of Czechoslovakia; Institute of Instrumental Analytical Chemistry (Brno); University of Brno; and University of Komensky. Pandey studied the instrumental techniques employed in Czechoslovakian research laboratories for metallurgical analysis, in particular the atomic and molecular absorption spectrophotometry. Because of low spectral interference, the atomic absorption technique is more specific than the molecular absorption technique, but chemical interferences occur in the former also. Dr Pandey discussed with scientists the problem of elimination of this type of interference by standard additions, flame conditions, removal of ions, etc. He also paid attention to the use of different flames and flameless atomization. The use of flame atomization is widely accepted because of the low cost and convenience, but there are some limitations such as

limited temperature range, poor atomization, background emission and absorption effects. The continuous radiation received by the detector adds considerably to the electronic noise level of the instruments. This problem is more acute with the bright nitrous oxide-acetylene flame. The Institute of Instrumental Analytical Chemistry (Brno) specializes in various types of chromatographic analysis. The use of radiometric material analyzer was being studied in the analytical chemistry division of Komensky University, Bratislava, which had developed a process for analyzing ash content in coal by means of β -ray material analyzer. The NML's scientist also discussed the use of background corrector in atomic absorption technique and removal of scattering effect.

* * *

Shri T.N. Rajan, in charge of training course in Information Science, Indian National Scientific Documentation Centre (Indoc), New Delhi, was deputed by CSIR at the instance of Indian National Commission for Unesco, to serve as an expert in assisting BANSDOC (Bangladesh National Scientific and Technical Documentation Centre) to conduct the National Workshop for Users of Scientific & Technical Information. The workshop was held at Dacca on 13 and 14 February 1979. The main objective of the workshop was to focus attention on the effective use of documentary/non-documentary sources for gleaning information for various purposes and also to expose users to a variety of tools and services for locating scientific and technical information and searching techniques employed in gaining easy and quick access to information. The workshop was inaugurated by Dr M.N. Huda, Minister for Finance and Planning, and the keynote address was presented by Prof. M. Ahmed, Chairman, BCSIR.

The participants were mostly senior scientists, technologists and engineers, representing the BCSIR laboratories,

Atomic Energy Commission, and other such bodies.

Three technical sessions were devoted to lecture-cum-demonstrations by Insdoc's representative on the information flow pattern overview of primary, secondary and tertiary sources of documents.

Appreciating the need for education in making effective use of information tools, the workshop recommended, inter alia, holding of short, regular user education courses for scholars, scientists, and engineers at all levels of university education to research.

* * *

Dr O.P. Arora of the National Botanical Research Institute (NBRI), Lucknow, was deputed to Poland from 17 July to 15 November 1978. Dr Arora visited Poland, under the bilateral exchange programme between India and Poland, to study the latest techniques used in chromosome analysis like 'giemsa banding', DNA estimation, and production and standardization of the new hybrid ornamentals and to familiarize himself with the techniques of F_1 hybrid seed production in ornamentals, particularly the use of male sterile lines.

Dr Arora visited several botanical institutions including the Institute of Pomology and Floriculture, Skierniewice, where work on improvement of ornamental plants through breeding and colchiploidy was being carried out. He analyzed the cytogenetic architecture of different cultivars of *Gerbera jamesonii* H. Bolus. A few of these double-flowered diploid forms were rendered tetraploids by colchicine. Dr Arora also visited the Institute of Vegetables, Skierniewice, which was engaged in exploitation of male sterility in raising F_1 hybrid seed production and the Institute of Medicinal Plants, Poznan, where medicinal plants were being cultivated and active principles therefrom isolated and tested. At the Institute of Plant Breeding and Genetics, Poznan, he attempted to work out the number of *Secale* (rye) chromosomes in various hexa- and

octoploid triticales by the use of C and N banding. A Polish variety of *Secale* was also analyzed for DNA content by microspectrophotometry. At the Agriculture Faculty of Lublin, which was engaged in the cytological analysis of different triticales, he studied the pairing behaviour with hexaploid summer varieties of triticales, viz. 800, 864 and 802, by the use of giemsa stain.

Dr Arora also delivered a lecture on 'Induction of variability in ornamental plants' at the Institute of Pomology and Floriculture, Skierniewice, and another on 'The role of polyploidy in the evolution of ornamental plants' at the Horticulture Faculty of Lublin.

* * *

Dr D.J. Mehta, Director, Central Salt & Marine Chemicals Research Institute, Bhavnagar, represented India at the Inter-regional symposium on Solar Energy for Development held in Tokyo from 5 to 10 February 1979. Twenty-seven countries participated in the symposium, for which UN was a sponsor, which concentrated mainly on solar collectors, solar heating and

cooling appliances, solar powered thermal engine, solar powered photo-voltaic cell, wind energy, storage systems for solar and wind energies, and solar energy for development and transfer of technology.

Dr Mehta presented a paper entitled 'Solar Energy Research and Development in India—Hopes and Challenges'. Giving a resume of CSMCRI's work in solar energy utilization, Dr Mehta mentioned that the laboratory had set up solar stills in non-electrified villages and that it had plans to fully convert such villages into 'solar' villages by setting up a variety of solar devices and gadgets for drying agricultural produce, lighting (by photovoltaic cell), space cooling, preserving food, ice-making in health centres, and running pumps required for irrigation.

Dr Mehta also visited the National Chemical Laboratory for Industry in Tokyo and the Chigasaki Test facility Centre in Chigasaki. Work on testing of tubular, spiral and halofine fibre modules for processing sea-water was under way at the Chigasaki Centre.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Two processes/products developed by the Central Electrochemical Research Institute (CECRI), Karaikudi, viz. (1) Magnesium Alloy Anodes for Cathodic Protection, and (2) Fluorescent Marking Ink, are ready for exploitation. These have been assigned to the National Research Development Corporation of India, New Delhi.

Magnesium Alloy Anodes for Cathodic Protection

Magnesium alloy anodes offer almost complete protection from corrosion to steel structures and equipment in oil, shipbuilding and chemical industries. The structure to be protected is made the cathode with reference to the external magnesium alloy anode.

The CECRI process for preparing

magnesium alloy anodes consists in melting the magnesium metal and other constituents in graphite/steel crucible and casting the anodes of required dimensions.

The estimated demand for anodes of such types is 200 tonnes/annum, and these are not manufactured in the country at present. The raw materials, other than magnesium, required for the CECRI process are available indigenously. Magnesium metal will also be indigenously available when the magnesium plant proposed to be set up in Tamil Nadu is commissioned.

The capital investment required for a plant of capacity 24 tonnes/annum (240 working days) is Rs 4.9 lakh and the cost of production, Rs 55/kg. The return on investment is expected to be 47%.

Fluorescent Marking Ink

Fluorescent marking ink is used in the re-admission control systems required in fairs, sports events, etc. The process of making the ink consists in mixing the appropriate ingredients in proper proportions. The luminescent substance in this composition is invisible in the ordinary light and becomes visible when exposed to ultraviolet light. At present such an ink is not produced in the country and a good demand is likely to be generated with the indigenous production.

CECRI has developed a simple process for making the ink, utilizing indigenous equipment and material. The ink is harmless to skin and clothing, withstands several handwashings, and stays for the required length of time in most of its applications.

The capital investment for a plant of capacity 3000 litres/annum (300 working days) is estimated at Rs 94,250 and the cost of production works out to be Rs 50 per litre. The return on investment is expected to be 53%.

ALUMINIUM-ALLOY CONDUCTORS

NML'S CONTRIBUTION TOWARDS DEVELOPMENT AND USE *

Although aluminium is being used for electrical transmission for the last two to three decades, it has not been accepted as a universal conductor of electricity because of certain inherent limitations in its ductility, corrosion resistance (particularly in saline and industrial atmospheres), and stability of joints. An R & D programme was initiated at the National Metallurgical Laboratory (NML), Jamshedpur, with the objective of developing electric-grade aluminium-

alloy conductor which offers itself not only as an improved version of electric-grade aluminium, but also as a substitute for copper in applications where the use of aluminium has not yet been accepted. The R & D work led to the development of a precipitation-hardening electric-grade aluminium alloy, designated as 'NML-PM2'—an alloy which has none of the drawbacks of the electric-grade aluminium.

Working in close collaboration with the industry, NML developed the industrial processing technology for NML-PM2 and transferred the technology to four industrial units in different parts of the country.

The use of NML-PM2 has been

established in welding cables, railway coach wiring cables, overhead electrical transmission lines, and transformers. Leading users of welding cables have now started recommending the use of NML-PM2. The superiority of NML-PM2 over electric-grade aluminium in overhead transmission lines has been accepted by the Gujarat State Electricity Board, who, following trials on the first use of 200 km of the conductor, are putting up additional overhead lines of about 300 km.

Similarly, NML is collaborating with the Bharat Heavy Electricals Ltd in producing a prototype 20 MVA power transformer designed, and now being fabricated, by using aluminium in place of copper. One phase of the transformer would be wound with NML-PM2 strips.

Besides for the above applications, NML-PM2 is suitable for use in house-wiring cables, paper-insulated conductors required in distribution transformers, etc.

NML-PM2 also possesses characteristics specified for the use of aluminium alloy in telecommunication cables. In collaboration with Hindustan Cable Factory, NML has processed 20, 50 and 100 pair telecommunication cables. These cables have been found to meet the specifications laid down by the Posts & Telegraphs Department. Following evaluation at the Telecommunication Research Centre, the cables have been installed in Delhi.

Aluminium is widely used in telecommunication cables in industrially advanced countries like UK. In India also it is but necessary to adopt a national programme of substitution of copper telecommunication cables with NML-PM2. Such a programme would help the country conserve its meagre resources of copper and cut down imports.

In view of the use of aluminium in overhead transmission lines and because of the fact that fully work-hardened, EC-grade aluminium is in vogue, NML is advocating the use of annealed aluminium conductors with steel reinforcement. If implemented, their use would reduce power losses in

*Scientists working on this project at NML are: Dr Rajendra Kumar, Dr Manjit Singh and Shri Kishori Lal. Also, refer to items published in CN, 28 (1978), 105 & 176, and CN, 26 (1976), 33 & 133.



NML-PM2 windings being manufactured at the factory of ALCOND, Calcutta



NML-PM2 welding cable being used at the factory of Tata Robins and Frazer Ltd, Jamshedpur

transmission lines because of the improved conductivity of the conductor and also by way of increasing the stability of the compression joints.

Intensive product evaluation work carried out in collaboration with several R & D organizations and industrial establishments has resulted in the appreciation of the potentials of the NML-PM2. The industry has now prevailed upon the Indian Standards Institution to upgrade their specifications dealing with EC aluminium so as to bring the composition of NML-PM2 within their ambit.

Another important area where alum-

inium can be used in electrical transmission lines is the electric traction which now uses copper in the form of catenary conductor and grooved contact wires. A medium-strength, medium-conductivity alloy NML-PM53 is undergoing field trials. Trials are being conducted by NML in collaboration with the Research Design & Standards Organization (RDSO), Lucknow, on the use of NML-PM53 as catenary conductor. Also, R & D work on another conductor NML-PM215 is being pursued for examining the possibilities of its use as a conductor for the grooved contact wires.

SEISMICITY MAPS, VELOCITY STRUCTURE, AND DSS STUDIES

BHATNAGAR PRIZEWINNER DR KAILA'S WORK*

Dr K.L. Kaila has made significant contributions to earth sciences and has

*Dr K.L. Kaila of the National Geophysical Research Institute, Hyderabad, has been awarded (jointly with Dr Subir Kumar Ghosh) the Shanti Swarup Bhatnagar Prize in earth sciences for the year 1977 [CN, 29(1979), 33].

propounded a number of new concepts and theories. He has developed five new methods in the fields of seismicity, upper mantle structure, solution of hidden layer problem and deep seismic sounding (DSS). He has recently postulated a new picture of the Indian

plate boundary which has given a serious jolt to the age-old and widely accepted concept of collision theory of the Himalayan orogeny.

Kaila has developed a new mathematical approach for preparing quantitative seismicity/seismic zoning maps. This method is based on some global relations established by Kaila and makes use of the earthquake data published by the world data centres. By using his method, seismicity maps can be prepared for small as well as large areas and even for the entire world at a low cost. Also, by this method, quantitative seismicity maps have been prepared at the National Geophysical Research Institute (NGRI), Hyderabad, for (i) India, (ii) South-west Asia, (iii) Europe, and (iv) Himalayan sub-province. Seismicity maps of (i) North America, (ii) South America, (iii) South-east Asia and (iv) the entire world are also being prepared. Recently, seismic risk and seismic zoning maps of India have been prepared using the new method. One of the important features of these maps is the most probable maximum acceleration map of India which gives the maximum acceleration to which a structure will be exposed during future earthquakes, and the seismic coefficients as given in this map can be used for designing earthquake-proof dams, bridges, nuclear power plants, multistorey buildings, etc.

A new analytical method has been developed by Kaila for finding upper



Dr K.L. Kaila

mantle velocity structure from body wave travel time data of deep earthquakes. Because of its adaptability to computerization, as against Gutenberg's method (1953) which was graphical in nature, this

method is being extensively used by seismologists in Japan, Italy and many other countries to study the Earth's upper mantle velocity structure. The upper mantle velocity structure has been

determined at NGRI, by employing this method, for Hindukush region, Japan, Tonga Kermadec, New Hebrides, Kuril, Kamachatka, New Guinea and Solomon Islands, all of which encompass the entire western Pacific region. The solution of the hidden layer problem given by Kaila is also of great value in interpreting refraction seismic exploration for oil.

Kaila planned and organized DSS studies for the first time in India along a 600 km long profile (Kavali-Udipi) in the Indian peninsular shield. This huge Indo-Soviet project with about 200 technical/non-technical field personnel for 4 to 5 months every year (during 1972-74) yielded for the Indian shield a detailed crustal structure with location of deep faults and fracture zones which may control distribution of minerals and ore deposits near the surface of the earth. The results of these investigations have provided new insight and have completely changed the old geological concepts regarding the development of the Cuddapah and Dharwar basins. Subsequently, two DSS profiles (each 200 km long) have been covered in Gujarat sedimentary basin and two DSS profiles (each about 200 km long) have been shot in the Koyna Dam area of the Maharashtra State for delineation of deep faults and fracture zones.

Dr Kaila (born 7 Sep. 1932, Lahore) did his M.Sc. in physics (1954) from St. Stephen's College of the Delhi University, and Ph.D. in geophysics from the Roorkee University. He worked for ten years as a field geophysicist, mostly as party chief of seismic field parties and in charge of the Central Interpretation Section in the Oil & Natural Gas Commission. For the last 13 years he has been working in NGRI, Hyderabad, and is presently holding the position of Scientist E. He is project leader and coordinator for the research area Deep Seismic Sounding and Seismicity for which he is also the area chairman. He has to his credit 53 research papers and six technical reports. He was awarded Krishnan Gold Medal for the year 1976 for his outstanding contributions in seismology and deep seismic sounding. He has presented many papers at international conferences, symposia and seminars in USSR, USA, Canada, Japan, Czechoslovakia, West Germany, etc. In 1976, at the invitation of the National Science Foundation of USA, he delivered lectures and seminar talks at several research institutions and universities in USA. He is editor of NGRI's

quarterly 'Geophysical Research Bulletin' devoted to earth sciences.

[For citation see CN, 29(1979), 36].

PATENTS FILED

847/Del/78: Technique for the preparation of granulated magnesium hydroxide, V.M. Sheth, M.R. Bhatt, B.M. Shah & S.D. Gomkale—CSMCRI, Bhavnagar.

892/Del/78: A process for the manufacture of collagen sheet or the like from mammalian tissues, Mahendra Kumar—CLRI, Madras.

CECRI Refresher Courses

The Central Electrochemical Research Institute (CECRI), Karaikudi, will organize three refresher courses on: (1) Electroplating (from 29 May to 6 Aug. 1979); (2) Corrosion and its prevention (7 Aug. to 10 Sep.); and (3) Storage battery technology (13 Sep. to 7 Nov.). For further details contact: Director, CECRI, Karaikudi 623 006.

CONFERENCE ANNOUNCEMENTS

Get-together of Scientists and Entrepreneurs

A get-together of scientists from the national laboratories and the medium and small entrepreneurs and an exhibition of the products and processes developed by the national laboratories will be held in Calcutta from 9 to 11 April 1979. To be organized under the aegis of the State R & D Committee, West Bengal, the get-together will give the entrepreneurs ample opportunity to meet scientists and to apprise themselves of the latest technical developments made by the various laboratories. Co-sponsors of the get-together are: National Research Development Corporation of India, National Council of Science Museums, Central Glass & Ceramic Research Institute (Calcutta), Small Industries Service Institute (Calcutta), etc.

For further details, readers may contact: (1) Director, Small Industries Service Institute, 111 & 112 B.T. Road, Calcutta 700035, or (2) Secretary, National Laboratories Get-together Committee, C/o CMERI, 20 R.N. Mukherjee Road, Calcutta 700001.

Medicinal & Aromatic Plants Abstracts (MAPA)

The Publications & Information Directorate (PID), New Delhi, has launched a new abstracting journal, *Medicinal & Aromatic Plants Abstracts* (bimonthly) as a successor to the mimeographed quarterly, *Bulletin of Indian Raw Materials & Their Utilization*—Ser. A (current literature on medicinal and aromatic plants) under the Current Awareness Service of the Medicinal & Aromatic Plants Information Service (MAPIS). The first issue of MAPA, brought out in February 1979, contains two main sections, viz. (i) Abstracts, carrying 323 informative abstracts under classified subject heads, and (ii) a bibliography on *Catharanthus roseus*, providing a selective list of references on the different aspects of the plant compiled from the titles available in PID's database. A subject index is also included. Review articles of topical interest relating to medicinal and aromatic plants are also proposed to be published from time to time in MAPA.

MAPA aims at bringing to the notice of the users the research findings, culled from the world literature in the shortest possible time, and serving thereby as an indispensable guide to research workers, entrepreneurs, government agencies, and men in drug and perfumery industries. Its annual subscription is Rs 40; (£ 7; \$ 17).

For copies the readers may contact: Sales & Distribution Officer, Publications & Information Directorate, Hillside Road, New Delhi 110012. A copy of the request order may be sent to the Editor (Shri S. Nagarajan).

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Dr N. Ramanathan

Acting Director of CLRI

Dr N. Ramanathan, Scientist F, Central Leather Research Institute (CLRI), Madras, has been appointed Acting Director of the laboratory with effect from 17 January 1979 [CN, 29 (1979), 21].

Dr Ramanathan (born 31 Dec. 1923) did his M.Sc. (first class with distinction) and Ph.D. from the University of Bombay. He joined the Victoria Jubilee Technical Institute, Bombay, in 1950. In 1952, he was awarded an international fellowship for research work at the

Leeds University, UK, wherefrom he obtained his second Ph.D. Joining CLRI in 1957, he has served in various capacities and has planned, organized and guided a large number of R&D projects on hides and skins, leather, leather fibres and footwear. He has also coordinated research projects of relevance to Defence organizations. He organized an international symposium on collagen and edited the proceedings of this symposium (published as a monograph by John Wiley, New York). He has made a number of original contributions to the structure and physical and mechanical properties of collagen fibres. His discovery of the directional friction effect in collagen fibres led to the development of processes to overcome defects in hides.

With special interest in footwear and comfort, Dr Ramanathan has studied the parameters of the feet and their

relationship to one another. This research led to the Mondopoint system of footwear sizes being modified by the originators to include the width of the foot in marking the shoes. A new shoe-sizing system was thus developed. Another of Dr Ramanathan's interesting contributions is a technique to measure the distribution of the weight of a person on the various segments of the feet. This is important for fitting proper shoes to abnormal feet. The electrical microbalance designed by Dr Ramanathan won an invention award from the National Research Development Corporation of India.

Dr Ramanathan did research in the National Research Council of Canada in Ottawa for a year and visited a number of tanneries and leather research laboratories in USA under the CSIR-National Science Foundation exchange of scientists programme.

A member of the Indian Standards Institution committees on belting and footwear, and a founder fellow of the Tamil Nadu Academy of Sciences, Dr Ramanathan has to his credit more than 150 research papers and a number of review and popular articles.

Solar Chilli Drier for Rural Areas

Sun drying of harvested crops, an oldest method of food preservation, is still practised in a fashion unchanged from that in ancient times. In recent times, however, some gadgetry have been developed with a view to (i) using the available solar radiation in a better and more effective way; (ii) reducing the

drying time of agricultural products; and (iii) obtaining a product free from dust, dirt and insect infestation.

The Regional Research Laboratory (RRL), Jammu, has developed 'solar driers' and these have been utilized for drying apricot in Ladakh area of Jammu and Kashmir. Conventionally, this fruit is dried in the open sun and the process takes 25-30 days. During this period, the commodity is open to contamination by dust and dirt, and the accompanying natural decay results in a poor-quality product. The RRL-Jammu scientists carried out trials for sulphuring the fruits before drying in order to preserve the natural colour, flavour and aroma of the fruit and to enhance storage life. Solar driers have been developed for drying the fruits in 3-4 days. Twenty-five sets of solar driers and fruit sulphuring chambers are in use in Ladakh area today. Such a unit works on solar and wind energy and does not require electricity or any other conventional fuel as energy source.

Encouraged by the success, the laboratory has devised a solar drier for drying Kashmir chillies. Red chillies of Kashmir are very popular throughout the country as these impart attractive bright red colour to the dishes. Chillies are produced in substantial quantities in

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Chillies being dried at the solar drier developed by RRL, Jammu

Kashmir valley. For household use, these are strung like a garland to be hanged on the doors and walls or spread on the rooftops for drying. For commercial use, the plants, with unplucked fruits are harvested and spread out on the ground for about a week to effect partial drying. Thereafter, the fruits are hand-plucked and spread in the field for final drying. The entire operation takes about 15 days. The commodity is exposed to the noxious effects of dirt, dust and fungus attack; besides the drying is not uniform.

The laboratory has installed a solar drier at the village Kakapora near Pampore (Dist. Anantnag). The drier completely dries the commodity in 4-5 days with a marked improvement in colour and storage characteristics. The gadget is constructed by using mud, stone pebbles and glass panes only and is specially suited for rural areas. It can be easily constructed by village artisans. A unit of $2.4 \times 2.4 \text{ m}^2$ size, capable of drying 80 kg of chillies per batch, costs Rs 325.

With the extensive use of such driers on a larger scale, the laboratory hopes to

produce sizable quantities of red chillies and other dried vegetables with an improved quality in rural areas.

Deputation Briefs

Dr S. Balakrishna of the National Geophysical Research Institute (NGRI), Hyderabad, participated, as an invitee of the Committee on Science and

Technology for Developing Countries (COSTED), in the meetings on 'Regional network for geoscience in south-east Asia' and 'Mineral resources in south-east Asia' held at Bangkok from 8 to 18 November 1978.

Six countries, viz. Malaysia, Thailand, Hong-Kong, Philippines, Indonesia and Korea, participated in the regional network meetings for geoscience. Possible ways of collaboration and cooperation among various countries of south-east Asia were discussed. The deliberations indicated that India could provide leadership in organizing training programmes in mineral exploration as well as groundwater surveys.

Dr Balakrishna presented a paper entitled 'Resistivity and seismic surveys for the proposed Polavaram Barrage across Godavari River' at the Third Regional Conference on Geology and Mineral Resources for South-East Asia held at the Asian Institute of Technology (AIT). He also delivered a special lecture on 'Physical properties of rocks and their relation to geological features' on 15 November 1978 at the invitation of AIT.

As an invitee, Dr Balakrishna attended a special meeting organized by the International Union of Geological Sciences and the Association of Geoscientists for International Development.

NEW TRENDS IN STRUCTURAL GEOLOGY

BHATNAGAR PRIZEWINNER DR GHOSH'S WORK*

Dr Subir Kumar Ghosh has made significant contributions to theoretical and experimental structural geology. Through ingeniously designed experiments with models made up of painter's putty, modelling clay, wax, grease, etc. he has produced features similar to different types of geological structures

*Dr Subir Kumar Ghosh of the Department of Geological Sciences, Jadavpur University, Calcutta, has been awarded (jointly with Dr K.L. Kaila) the Shanti Swarup Bhatnagar Prize in earth sciences for the year 1977 [CN, 29(1979), 33].

by deforming the models in indigenously prepared inexpensive apparatuses. He has combined his experimental investigations with theoretical studies by applying the principles of mechanics to fundamental problems on the origin of geological structures.

Through experiments on buckling folds, Ghosh established the geometrical relations of the axial surfaces of folds with the principal planes of deformation. The experiments also elucidated the manner in which 'refraction of cleavage'

takes place in folded rocks. From other experiments he specified the physical conditions which favour the development of kink bands and of conjugate, chevron and parallel folds, or of folds intermediate between these ideal geometric types, in multilayers which permit inter-layer gliding.

The theoretical and experimental studies by Ghosh have elucidated the different aspects of the problem of superposed folding. In his experiments Dr Ghosh distinguished superposed folds from interfering fold-patterns produced in a single deformation. He has also derived quantitative expressions for the physical factors which control the wavelengths of certain types of superposed folds and of synchronously produced 'cross folds'. Dr Ghosh's investigations of superposed folding also entailed an analysis of strain distribution over different types of superposed buckling folds. He has delineated the manner in which early lineations are reoriented by complex combinations of homogeneous strains and external rotations. In other experiments he has studied the outcrop patterns of superposed folds. Among other features, this investigation has



Dr Subir Kumar Ghosh

shown that quite dissimilar outcrop patterns may be produced by different types of fold interference.

Ghosh has developed a theory of fundamental aspects of conglomerate deformation by utilizing the principles of deformation of nonhomogeneous materials. Again, in some of his recent investigations, he has distinguished between unlike rotations of rigid inclusions and passive markers. He has utilized these theoretical and experimental results to analyze the development of an echelon arrangement of boudins, to interpret drag patterns of foliations around rigid porphyroblasts and to explain the patterns of inclusion-trails in paratectonic porphyroblasts.

Ghosh is interested in the application of theoretical and experimental results to actual field problems. He is also interested in problems concerning the time-relations between tectonic and migmatitic events and has analyzed the tectonic-migmatitic histories of such terrains as the Kuilapal area of West Bengal and certain parts of the Scandinavian Caledonides.

Dr Ghosh worked in collaboration with Prof. Hans Ramberg of the Uppsala University, Sweden, for some years, and participated in several research schemes of the Swedish Geodynamics Project (from 1974 to 1976). Elected recently a Fellow of the Indian National Science Academy.

[For citation, see *CN*, 29(1979), 36].

UTILIZATION OF SLUDGE GAS FOR OPERATION OF GAS TURBINE ENGINES

NAL'S ENDEAVOUR

Municipal sewage treatment plants yield a gas with methane content of about 68% as a result of bacterial action on sewage sludge. A rough estimate shows that 10 litres (0.35 cft) of gas is produced per capita per day in sewage treatment plants with primary sedimentation process. This is equivalent to about 5 kWh electrical energy per capita

per annum which may be compared with the national average (1973-74) of 88 kWh per capita per annum. On the basis of these figures, it is estimated that the electrical energy which may be theoretically obtained from the sludge gas generated by a population of a city like Delhi would be 22×10^6 kWh per annum with an installation of 7.5 MW,

and for a city of the size of Bangalore, 9.4×10^6 kWh (approx.) at 3.2 MW installation.

This gas has several potential applications as a fuel or as a stock for chemical products. At present, sludge gas is not utilized to any extent in India and is simply flared away. It certainly appears feasible to utilize this gas to provide mechanical or electrical power to a small number of users in the vicinity of sewage plants so that the problems of transmission and fluctuation in availability are reduced.

NAL's work

The National Aeronautical Laboratory (NAL), Bangalore, has initiated work to utilize the sludge gas for the operation of time-expired aerogas turbine engines which are available at nominal cost even within the country. Such a system would have the advantage of low capital cost and would be suitable for intermittent use in keeping with the sewage plant requirements. Aerogas turbines of the turbo-prop variety could be suitably modified to drive a mechanical load such as compressor or an electrical generator by the simple substitution of the propeller, whereas a turbo-jet engine would require an additional power turbine and, probably, a gear box to extract the energy from the turbo-jet exhaust. The high calorific value of the sewage gas (6000 kcal/Nm^3 approx.) implies that efficient combustion would be possible with a few modifications to the existing combustion system. A number of turbo-prop engines such as Rolls Royce-Dart and Russian AI-20s are currently operational in India and a number of them are available after their useful life for aircraft use has expired. It is believed that such engines could have a useful additional life for ground use, subject to some derating, but the actual life and output need to be determined by experience. It is estimated that a Dart engine could give about 1200 to 2000 shaft HP (depending on type) and that an AI-20 could give about 3300 shaft HP.

A tentative study on the economics of power generation with sludge gas



A view of the NAL's sludge digestors at the K&C Valley Sewage Treatment Plant. Each digester is 110-ft (about 33.5 m) in diameter and has a capacity of 1.5 million gallons. The pilot gas holder is seen in the foreground

indicates that the capital cost would be approximately half that of a diesel-generator installation in the range 600-900 kW capacity. The recurring cost would, of course, depend on the pricing policy to be adopted for sludge gas. It appears that the generating costs would be significantly lower than the equivalent diesel generation cost, even if the price per thermal unit of sludge gas is made equivalent to the retail price of coal.

Demonstration project

The K & C Valley Sewage Treatment Plant of the Bangalore Water Supply and Sewerage Board is situated less than a kilometer away from the Wind Tunnel Centre of NAL. This plant has a design capacity of 36 million gallons per day and is estimated to yield about 3.5 lakh cft (9900 Nm³) of sludge gas per day. This would be a suitable place to demonstrate the concept of utilizing time-expired turbo-prop engines on sludge gas. A successful demonstration at this plant could then form the basis for wider applications elsewhere in the country.

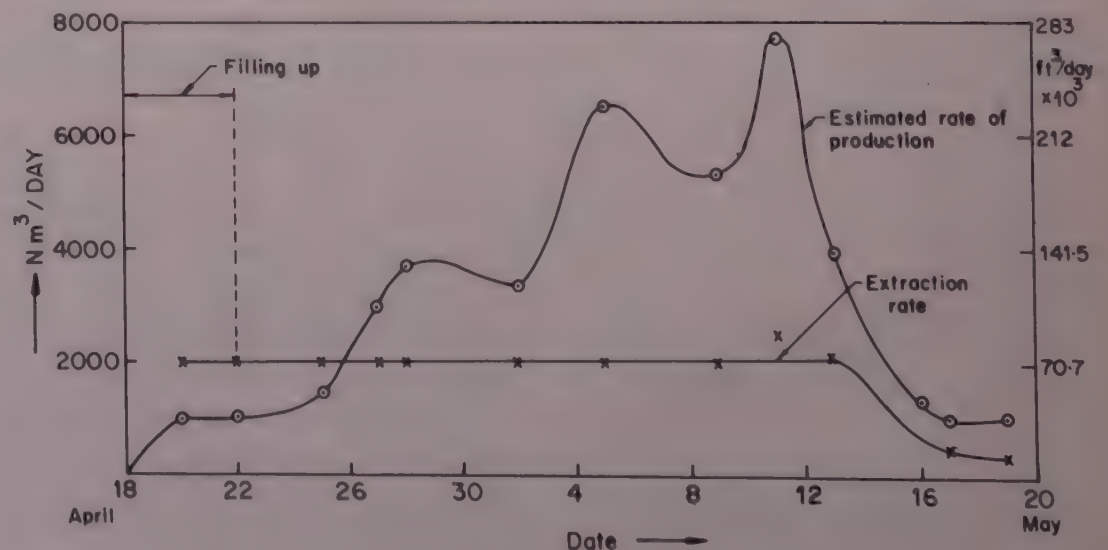
The first demonstration is proposed by the Propulsion Division on a time-expired Dart 514 engine. The sludge gas

which is generated in the sludge digestors would need to be collected in a large gas holder of about 80,000 cft (2266 m³) capacity. Thereafter, the gas would be compressed in a gas compressor to six atmospheres, because the injection system in the Dart engine would be progressively retrofitted for sludge gas injection. For the initial demonstration, the propeller would be retained as a load. This could be subsequently replaced by an electrical generator or a compressor to deliver compressed air to the wind tunnel facility. In the latter case

the engine and compressor would be situated near the Wind Tunnel Centre and the sludge gas would be piped accordingly. With such a system, it is expected that the Dart engine could be operated for 4 hours a day giving about 3500 kWh per day. The capacity could be enlarged if the experiment proves successful.

Feasibility studies

Some experiments conducted in 1976 indicated that the gas available at the burner ports where gas is flared was far below the expected figure mentioned above. It was clear that the gas was leaking through numerous hairline cracks in the digester domes. Efforts to repair the cracks were not successful and a permanent solution is yet to be found. However, fermentation experiments in the laboratory using the sludge samples obtained from the plant showed that the generation rate and quality of the gas were quite high and within the expected ranges. Further experiments at the sewage treatment plant were therefore proposed to be undertaken to directly measure the gas availability. It was felt that if the gas is extracted from the digester domes with the aid of a small blower and collected in a gas holder, the leakage rate could be reduced by limiting the excess pressure in the digester. For this purpose a 1000 cft (28 m³) capacity pilot gas holder was set up at the sewage treatment plant.



Gas production rate from digester 4 (April-May 1978)

Experiments were conducted in April-May 1978 for a period of one month. The extraction rate with installed blower was found to be 2000 Nm³/day (approx.) and with this rate of extraction the pressure in the digester domes was still positive indicating that the generation rate was higher than the extraction rate. The generation rate, estimated on the basis of pressure measurements, is shown in the graph. It appears that the gas generation rate rapidly increases after about 2 or 3 days of the filling up of the digester and starts coming down after about 21 days. In the sewage treatment plant, there are four such digestors at present and the total capacity of the plant for gas production can be estimated by superposition. Such

an estimate for this period indicates that the gas production rate would be between 9000 and 14,500 Nm³ per day for the entire plant. However, experiments in the laboratory have indicated that large fluctuations may occur because of the complex factors, both physical (such as temperature) and biochemical. Even assuming that the gas production rate is based on the actual extraction rate of 2000 Nm³/day per digester, the gas production from the plant would be in excess of 7500 Nm³/day—a quantity sufficient to run the Dart engine for about 10 hours per day. This suggests that enough gas for the first phase of the demonstration, i.e. for operating the Dart engine for four hours per day, would be available.

CREEP RESISTANT STEELS FOR THERMAL POWER PLANTS

NML'S CONTRIBUTION FOR DEVELOPMENT AND USE*

The establishment of industrial units manufacturing machinery for the thermal and nuclear power plants has generated a demand for special steels, and as such steels are not available in India, these have to be imported at a cost of several crores of rupees annually in foreign exchange. These steels, conventionally known as creep-resistant steels, are required to possess guaranteed long-term mechanical properties at elevated temperatures. The failure of metal under creep conditions of service (prolonged exposure at elevated temperature and load considerably below the yield stress) is a result of interaction between slow deformation (creep) and microstructural deterioration (creep damage). Therefore, it is technologically desirable that the steels are thermally so stable as to resist the creep and creep damage, i.e. slip, recrystallization,

rotation of grain, grain boundary thickening and migration, formation of voids and cracks at grain boundaries, etc. Since such ideal creep-resistant steels are not likely to be available at economically viable prices, a life of 10⁵ hr (11.5 years) is usually anticipated for such materials. Premature and unanticipated failures of power plant components cause a direct revenue loss of Rs 2-5 lakh per day in case of a 100 MW unit. It is, therefore, of paramount importance that the steels used for the manufacture of power plant components, viz. pressure vessels including tubing, rotors, steam chest, bladings, etc., are made of proven quality steels.

While the several known grades of creep-resisting steels could be manufactured with the equipment and processing expertise available with the steel producers in the country, these are not likely to be accepted well by power plant manufacturers because of the lack of high temperature data in terms of stress-time to rupture-temperature relationships. In view of the strategic and

economic importance of these steels in the energy sector, their indigenous development was undertaken with the participation of the National Metallurgical Laboratory (NML), Jamshedpur, as the quality assurance agent: creep data are strongly sensitive to steel making process, hot working methods, heat treatment, dispersion of phases, presence of residual elements and inclusion.

In the first phase of work at NML the following steels were identified for priority development: (i) $\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\frac{1}{4}\text{V}$ casting; (ii) $1\text{Cr}-\frac{1}{2}\text{Mo}$ steel for seamless tubing; (iii) $1\frac{1}{4}\text{Cr}-1\text{Mo}-\frac{3}{4}\text{V}$ Ti and B bolting steel; (iv) En20B bolting steel; (v) $1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}$ and $2\frac{1}{4}\text{Cr}-1\text{Mo}$ steels for seamless tubing; and (vi) Cr-Mo and Cr-Mo-V castings.

The laboratory R&D work consisted of long-time testing for generation of creep stress-rupture data and their correlation with microstructures and optimization of heat treatment parameter in order to ensure that the indigenous steels possess creep and other properties identical with those specified in corresponding international/foreign collaborator's specification. According to the present international practice, creep tests should extend at least up to 33,000 hr for reliability. Data for periods up to 30,000 hr have been generated at NML on several casts of the above mentioned steels and compiled in the form of data sheet for the benefit of design engineers.

The utilization of the R&D effort has resulted in the acceptance of the first four of the grades of steels mentioned above, and has led to a saving of foreign exchange to the tune of several crores annually, according to the estimate prepared by the Bharat Heavy Electricals Ltd.

Residual life of power plant components
Design engineers overcome the uncertainties in the long-term service condition of power plant machinery manufactured by using creep resisting materials by incorporating a higher factor of safety. Since many of the

*Scientists working in this project at NML are: Dr Rajendra Kumar, Shri K.M. Choudhury, Shri Raghubir Singh, Shri L.N. Das and Shri K. Prasad.

thermal power stations in the country have either already completed their designed life or are approaching it, it is desirable to know whether the material is capable of giving further service, and to what extent. This information is of vital importance as utilization of such quality material for time longer than the designed life would result in considerable savings in funds and would also ensure optimum utilization of materials. It is not easy to furnish information of this kind. However, expertise has been developed at NML to provide this kind of advice to the thermal power stations. From the experimental point of view accelerated creep tests are performed for periods up to three months and the data obtained are extrapolated after examining the microstructures very closely, particularly in terms of the extent of accumulated creep damage.

The laboratory has provided the expertise to examine the premature and repeated failures in tubing systems at an important and relatively young thermal power station. The findings further indicated that the operational abuses were not responsible for such failures as they could be more readily accounted for by the material deficiencies.

Ni-free austenitic steels

In continuation of the development of the technology for producing the Ni-free austenitic steels, NML has shown that these steels possess superior high-temperature properties. Two grades of steels are under evaluation for suitability as exhaust valves for automotive engine and for heat exchanger in primary circuit of nuclear reactor.

PROGRESS REPORTS

RRL-Trivandrum Annual Report: 1978

The Regional Research Laboratory* (RRL), Trivandrum, has brought out its

*Formerly designated as CSIR Trivandrum Complex.

first annual report. The report [16 pages (foolscap), mimeographed], outlines the research activities of the laboratory during 1978 under its three divisions, viz. (i) Food and Spices, (ii) Materials (including Glass & Ceramics, Metals, Polymers and Composites, and New Energy Sources), and (iii) Systems Planning & Research Management.

Fourteen major projects and one minor project were under investigation. Of these, fifteen projects were industry-identified. Major thrust was made in the following areas: (1) Investigations in spices, tree nuts and tubers to improve the methods of processing and utilization of these products, (2) Optimization of the surface modification of refractory oxides and natural fibres of the region for better uses in composites, (3) Evaluation of clays and other mineral resources of Kerala for development of new products and to help set-up industries, (4) Preparation of composites based on metal matrix and polymers through powder metallurgy and injection moulding techniques, and (5) Fabrication of a solar furnace for processing materials and for melting purposes.

An experimental model of a drier for drying green cardamom was fabricated in collaboration with the Central Food Technological Research Institute, Mysore. Field studies were carried out in a cardamom estate and encouraging results were obtained. Laboratory studies on separation of pungency and colour of chilli oleoresin were completed. The scaling-up studies indicated the possibility of setting up small-scale industrial units for producing high pungency low-colour oleoresin capable of being put to pharmaceutical uses.

Research was taken up on the characterization of natural fibres like coconut fibre and pineapple leaf fibre. Coating of copper on coconut fibre was standardized. A high-temperature rotating crucible viscometer and a solar concentrator were fabricated.

An interim report on the analysis of clay was submitted to the Mining and Geology Department of Kerala State.

Revenues from consultancy registered an increase of 100% over last year's figures. Analytical testing services were rendered to 40 parties.

Research papers published/sent for publication numbered 18.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Copper Sulphate

The Regional Research Laboratory (RRL), Bhubaneswar, has developed a process for the preparation of copper sulphate. Copper sulphate finds extensive use in agriculture, as it forms an active ingredient for fungicides. A starting material in the preparation of many copper compounds, copper sulphate has its use in the manufacture of rayon also. A good algacide, it is used in the control of algae in reservoirs and water supply systems. It is also used in the preparation of copper ferrocyanide required in photographic toning bath; as a mordant in textile industry; and as an electrolyte in electroplating.

The process envisages the use of waste sulphuric acid from detergent plants. The waste acid is suitably diluted and passed from the top of the tower packed with copper scraps preheated to the required temperature. The saturated solution of copper sulphate produced at this stage is treated with active carbon and filtered. The resulting liquor, on evaporation and crystallization, yields pure crystals of copper sulphate. The method is also applicable to commercial sulphuric acid.

The process has been studied on a bench scale of 500 g per batch.

Scrap copper, waste sulphuric acid from detergent plants, or commercial sulphuric acid, and active carbon are the main raw materials required in the

process. All these are available indigenously.

The items of plant and machinery required for the process are: acid storage tank, mixing and diluting tank, column reactor treatment tank, active carbon, filter, crystallizer, tray drier, pump, and boiler. All these items can be fabricated/purchased indigenously.

A plant with a capacity of 600 tonnes per annum is estimated to cost Rs 19 lakh (fixed capital on building, Rs 0.7 lakh; fixed capital on plant, Rs 4.7 lakh; and working capital, Rs 13.5 lakh). The cost of production is estimated to be about Rs 8000 per tonne.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

PERSONNEL NEWS

Honours & Awards

RRL-Hyderabad Scientists Win OTAI Awards

Dr G. Lakshminarayana, Dr R. Subbarao, Dr A.J. Pantulu and Dr M.M. Paulose of the Regional Research Laboratory (RRL), Hyderabad, have won three awards of the Oil Technologists' Association of India (OTAI).

Dr G. Lakshminarayana, Head of the Oils & Fats Division, won the OTAI gold medal for 1978. Dr Lakshminarayana has developed newer, sensitive and simpler methods for the detection of adulteration of oils and fats. His contributions have led to the development of improved processes for the manufacture of various products from castor oil such as tallow-like hard fat, dehydrated castor oil fatty acids, hydrogenated castor oil fatty acids and also for sodium stearoyl lactylate — a dough conditioner necessary for manufacturing protein-fortified bread from wheat flour and oilseed flours. His studies on the effect of environmental factors on oil yield and characteristics

and composition of sunflower seed oil, composition of mango kernel fat, and on other newer sources of oils are useful to the oil industries.

Dr R. Subbarao won the Jaipuria Gold Medal of OTAI for 1978. He got the award for developing and analyzing newer surfactants from castor oil and cardanol, a distillation product of cashew nut shell liquid.

Dr G. Lakshminarayana, Dr A.J. Pantulu, Dr M.M. Paulose and Dr R. Subbarao jointly won the Prag Narain Memorial Award of OTAI for 1978 for their project report on 'Chemicals from castor oil'. This is a comprehensive report on the various chemicals that can be manufactured in small, medium and large scale industrial sectors. [Copies of this report can be had from the Hon. Secretary, Oil Technologists' Association of India (Central Zone), C/o Harcourt Butler Technological Institute, Kanpur 208002].

The awards were presented by the Deputy Prime Minister and Defence Minister Shri Jagjivan Ram during the International Congress on Oilseeds and Oils held at New Delhi from 9 to 13 February 1979. The congress was sponsored by OTAI and many other associations from different countries.

Indian Paints Association Award for CLRI Scientists

Dr S. Rajadurai, Shri C. Saikumar and Dr M. Santappa* of the Central Leather Research Institute (CLRI), Madras, have won the Indian Paints Association (Calcutta) Award for the year 1978. The Indian Paints Association has instituted two categories of annual awards — in research papers and review papers categories — to encourage research work in the field of paints and allied products. The CLRI scientists have won the highest award in the research paper category for their paper titled 'Synthesis and application of polyurethane for use in protective coatings'. This paper has

*Dr Santappa is now the Vice Chancellor of Sri Venkateswara University, Tirupati.

been selected from amongst the 200 papers received. The award carries a cash of Rs 3000.

PATENTS INFORMATION

Indian Pat. 3/Del/76*

Improved process for the preparation of pure potassium nitrate

S.N. MAHAPATRA, S.N. DAS & P.K. PALIT

Regional Research Laboratory, Bhubaneswar

Potassium nitrate finds extensive use in the manufacture of gun powder and formulation of explosives and fireworks. It is also used in drugs and pharmaceuticals, safety matches, textiles and textile auxiliaries, fertilizers, and in glazing ceramics and enamel wares.

Potassium nitrate is generally prepared by reacting potassium salt with nitric acid or a nitrate-containing salt like calcium, sodium or ammonium nitrates. In India, it is generally extracted from a soil called 'kalmisora' by successive crystallizations. In Israel, potassium nitrate is prepared by reacting potassium chloride with nitric acid in the presence of an organic solvent like amyl alcohol. The amyl alcohol preferably extracts hydrochloric acid and thereby favours the reaction for the formation of potassium nitrate. At present, Israel is producing nearly one lakh tonnes of potassium nitrate per annum employing this process.

The process covered under this patent is similar to the process mentioned above except that the use of the organic solvent has been completely eliminated. The patent relates to a simple and improved process for preparing pure (99.5-99.8%) potassium nitrate from potassium chloride by reacting with aqueous nitric acid (56-70%) under suitable temperature range. At first the potassium chloride is allowed to react with nitric acid so as to favour the formation of potassium nitrate and, subsequently, the system is heated to

*Accepted

dissolve the potassium nitrate formed, so that no solid chloride impurity remains in the system. Subsequently the potassium nitrate is crystallized out of the system, first at room temperature and later around 0°C in the presence of adequate amount of potassium chloride in solution. The product is separated and dried at about 100°C. The byproduct is a mixed acid containing hydrochloric acid and unreacted nitric acid and potassium chloride.

This process is simpler compared to the existing processes and involves neither high-temperature catalytic reaction nor use of any organic solvent. The byproduct mixed acid is a very useful one and can be used for the preparation of pure ureanitate to utilize unreacted nitric acid present in the medium (Indian Pat. application No. 495/Del/77) and for the decomposition of phosphatic ores and magnesite minerals. A process has been developed, whereby after the decomposition of magnesite rocks (low grade) magnesium value is recovered as carnallite from its solution and the filtrate is reused for the preparation of potassium nitrate (Indian Pat. application No. 399/Del/78). The total yield of pure potassium nitrate by the above processes is 80-85% with respect to utilization of nitric acid.

PATENTS FILED

753/Del/78: An improved process for the preparation of cervical dilators, J.P.S. Sarin, R.C. Nandi, S. Singh & N.M. Khanna—CDRI, Lucknow.

756/Del/78: Electro coatings from modified castor alkyd resin systems, S. Guruswamy, P. Jayakrishnan, V. Yegnamaran, N. Shanmugam & R. Rajagopal—CECRI, Karaikudi.

904/Del/78: Heat sensitive process for document copying purposes, P.K. Gupta, V. Raman & Rahul Kumar—NPL, New Delhi.

921/Del/78: A process for the preparation of 1,2-dihydro-2-oxo(1*H*)-quinoxaline and its alkali metal salts

from 1,2,3,4-tetrahydro-2-oxo(1*H*)-quinoxaline, S.K. Rao, U.T. Bhalerao, J.K. Rao, R. Rao, A.P. Kahol, A.A. Khan, D. Sadasivudu & V.K.V. Rao—RRL, Hyderabad.

923/Del/78: Improved process for simultaneous dehydration and hydrogenation of oils for fat materials containing hydroxy fatty acid moieties, M.M. Paulose, B. Vishwanadhan, J. Laxminarayana, P. A. Ramalingaswamy, D.S. Raju, A.J. Pantulu & G. Lakshminarayana—RRL, Hyderabad.

924/Del/78: A microbial process for the recovery of copper from Indian copper ores, M.M. Nandi & B.R. Sant—RRL, Bhubaneswar.

925/Del/78: Improvements in or relating to the preparation of a plastic filter to transmit infrared radiations in the range 1-3 microns, C.V. Suryanarayana, H.N.R.V. Rao, Y.V.P.R. Row, K.K.P.J. Pillai, V.S. Subramanian & K. Ramakrishnan—CECRI, Karaikudi.

927/Del/78: A new continuous agitating processing cooker for canned acid fruits, V. Nagaraju, A. Chakravarty & A. Narayanaswamy—MERADO, Madras.

928/Del/78: An improvement in the design feature of air distribution system in vertical shaft kiln, B.C. Jena, D.K. Dutta, U. Choudhury, B.B. Chaliha, U.C. Borah & S.N. Dutta—RRL, Jorhat.

929/Del/78: A process for making heat-sensitive copying paper for use in document-copying machine, P.C. Mehendru, K.K. Jain, V.S. Panwar, Satbir Singh & R.C. Bhatheja—NPL, New Delhi.

PATENTS SEALED

695/Cal/75 (143324): Improvements in or relating to the preparation of inhibitive pigments, K.S. Rajagopalan, S. Guruviah, M. Sundaram & V. Chandrasekaran—CECRI, Karaikudi.

1439/Cal/76 (143320): Improvements in or relating to the production of moulds and cores for the manufacture of

castings, G.N. Rao & S.K. Sinha—NML, Jamshedpur.

113/Cal/75 (143338): Process for the extraction of nickel and cobalt values from lateritic and nickel ferrous ores, B.N. Singh, M. Mahanty, D.D. Akerkar & V.A. Altekar—NML, Jamshedpur.

237/Cal/76 (142958): An improved process for the production of fish protein concentrate from trash mammal fish, S. Chand, K.L. Ghosh & S.N. Mahapatra—RRL, Bhubaneswar.

Directory of Indian Scientific and Technical Translators

In view of the rapid increase in the demand for translation of scientific and technical literature into and from foreign languages, and the growth of a band of foreign language translators in India, the Indian National Scientific Documentation Centre (Insdoc), New Delhi, has recently brought out a directory with the above title. The directory lists names and addresses of 651 translators who were found eligible after an assessment.

The first of the two parts of the directory gives the addresses of the translators along with their subject and language specializations. The foreign languages from (into) which they are capable of translating or interpreting into (from) English and Indian languages are also listed against their names.

The second part gives seven indexes: (1) language specialization, (2) subject specialization, (3) town-translator distribution, (4) ability to translate into foreign languages, (5) interpreters, (6) Indian language expertise, and (7) staff translators.

The directory has been prepared under the supervision and guidance of Shri C.V.N. Swamy, head of Translation Division, Insdoc.

Priced at Rs 15 (\$5) per copy the directory can be had from the Scientist in charge, Insdoc, Hillside Road, New Delhi 110012.



CSIR NEWS

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Prospects of Chemical Industries in Orissa

Seminar at RRL-Bhubaneswar

Although the state of Orissa is endowed with enormous natural resources and skilled and unskilled manpower, its industrial development, particularly that in regard to the chemical industry, is not satisfactory. In view of this the Regional Research Laboratory (RRL), Bhubaneswar, organized a seminar on 'Prospects of chemical industries in Orissa' on 3 March 1979. The Seminar was inaugurated by Shri H.N. Bahuguna, Union Minister of Petroleum, Chemicals and Fertilizers. Shri Nilamoni Routray, Chief Minister of Orissa, presided.

About seventy delegates from the laboratory and other organizations participated in the seminar in which 21 papers were presented and discussed in two technical sessions.

In the first technical session, 11 papers on the scope for the development of

inorganic chemical industries were presented. These papers covered: development of chromium chemicals, dichromate and related industries; catalysts; preparation of vanadium pentoxide from mineral sources and alumina industry byproducts; preparation of synthetic rutile; development of chlorine based industries, salt and marine chemical industries; iron oxide pigments; copper sulphate; etc. Dr H.P. Mishra, Chairman, Industrial Promotion and Investment Corporation, Bhubaneswar, presided over the session.

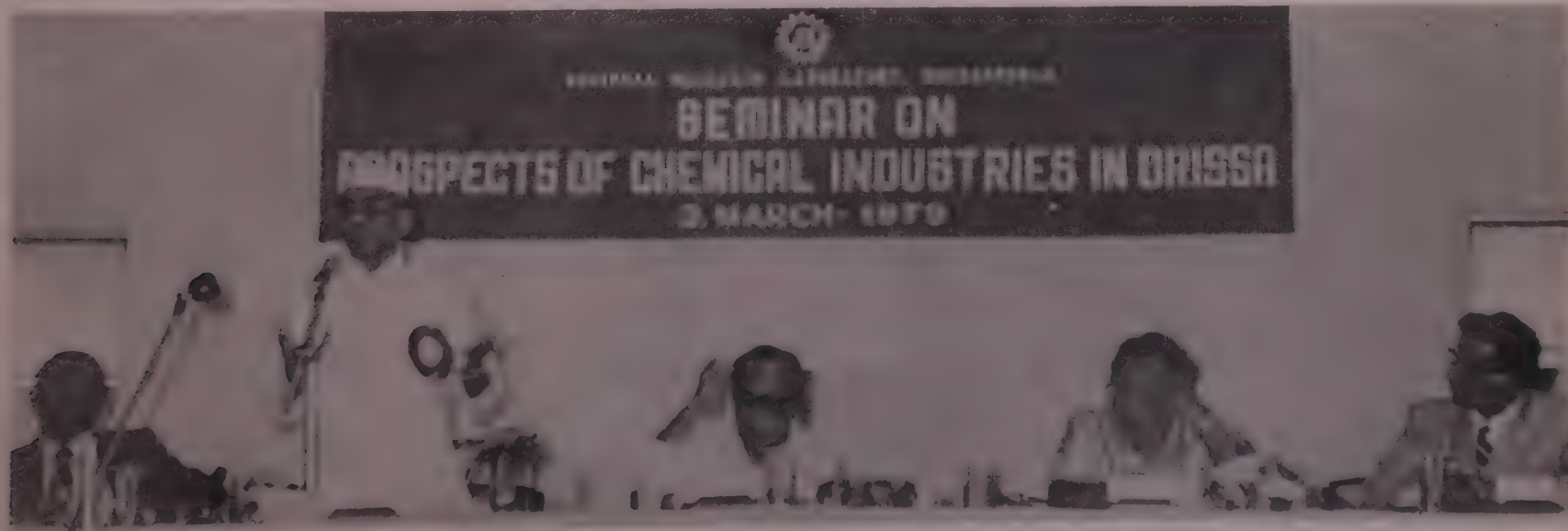
Ten papers were presented and discussed in the second technical session on 'Organic chemical industries' which included the scope of utilization of forest and marine wealth of Orissa, and setting up of various chemical industries in and around Rourkela, Talcher and other

places; preparation of synthetic organic chemicals; and cultivation of various aromatic and medicinal plants. Extraction of steroid sapogenins, alkaloids and essential oils for the pharmaceutical industries in India with special reference to Orissa was also discussed. Prof. M.K. Rout, Principal, Ravenshaw College, Cuttack, presided over this session.

Welcoming the gathering, Prof. P.K. Jena, RRL-Bhubaneswar's director,

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Shri H N Bahuguna, Union Minister of Petroleum, Chemicals and Fertilizers, inaugurating the seminar on 'Prospects of chemical industries in Orissa' on 3 March 1979 at RRL-Bhubaneswar. Sitting on the dias are (from left): Prof. P.K. Jena, Director, RRL-Bhubaneswar; Shri Nilamoni Routray, Chief Minister of Orissa; Shri H.C. Buxipatra, Minister of Industries, Mining and Geology, Orissa; and Dr B.R. Sant, Assistant Director, RRL-Bhubaneswar.

stressed on the role of chemical industries in determining the socio-economic status of a nation and mentioned the vast natural resources of Orissa which can be utilized in establishing various chemical industries. He also gave a resume' of the work being carried out by the laboratory in this direction.

Shri Bahuguna, in his inaugural address, mentioned the various centrally sponsored projects in the state and assured all possible assistance in this regard. He appreciated RRL's work in developing various projects and technologies and suggested that the various promotional agencies of the state should take advantage of these processes and products and help entrepreneurs in commercializing them.

In his presidential address, Shri Routray said that a number of chemical industries and fertilizer plants were being planned in the state and requested the Central Government to provide sufficient financial assistance for implementation of these projects.

Shri Harish Chandra Buxipatra, Minister of Industries, Mining & Geology, Orissa, was also present on the occasion.

An exhibition organized in this connection attracted a number of visitors including industrialists and entrepreneurs.

Indo-Australian Magnetometer Array Experiments

In a collaborative project, under the Indo-Australian Agreement on Science and Technology in the area of geoelectromagnetism, between the Indian Institute of Geomagnetism, Bombay, the National Geophysical Research Institute, Hyderabad, and the Research School of Earth Sciences of the Australian National University, a magnetometer array experiment is being carried out in the region of the Lower Himalaya, the Punjab and the Aravallis.

Seventeen instruments have already been installed by the Indian and Australian scientists. Continuous photographic recording will be carried out at these temporary magnetic observatories for about three months and the data obtained will be processed and interpreted along with the available geological and geophysical data (seismic, gravity, heatflow, deep seismic sounding, etc.) from the region.

The project aims at investigating the electrical conductivity of the crust and the upper mantle from the Lower Himalayan ranges down to Kanyakumari, the oceanic induction effects and the equatorial electrojet in the Peninsular India. The timing of the project synchronizes with an international project called ELAS (Electrical Conductivity of the Asthenosphere) being carried out under the aegis of the International Association of Geomagnetism and Aeronomy (IAGA) of IUGG.

A second array experiment is scheduled for September-December 1979 in the southern tip of the Peninsular India containing the magnetic (dip) equator and the electrojet. The Indian scientists have already identified, during the last decade, severe induction anomalies including the 'ocean effect' in the geomagnetic data recorded in this region.

The magnetometer array experiments are designed to unravel the geological, geophysical and geodynamical processes and their interrelationship in these regions.

Dust Extractor

NRDC Awardwinning Invention

Pneumoconiosis, a disease caused by inhalation of fine respirable dust, is an occupational hazard for the mining community all over the world. Drillers are prone to the disease to a greater extent as they are subjected to the high concentrations of airborne dust. Drilling produces 10 to 30 kilograms of dust per coal face. A part of the dust gets airborne

during drilling and another part gets airborne during subsequent blasting and other operations.

The Central Mining Research Station (CMRS), Dhanbad, has developed a dust extractor which collects and conveniently disposes of more than 99% of the total dust produced during drilling, and reduces 85% of the airborne respirable dust at the drilling face. The dust level at the drilling face is reduced to well below the permissible safe limits (650 ppcc).

Designed to suit the aptitude of the miners and the mining conditions, the device has a drill rod that passes through the dust extractor during drilling. The dust produced during drilling is conveyed by the screw action of the drill rod and is collected in a bag through a side port. The device is handy and the spares are cheap, readily available and easily replaceable.

The inventors, Dr J.K. Sinha, Shri P. Kunhunni and Shri S. Bagchi, figure among the inventors who won the National Research Development Corporation of India's 1979 Republic Day Awards for meritorious inventions [CN, 29 (1979), 22].

RRL-Jorhat Develops Improved Strain of Java Citronella

The Regional Research Laboratory (RRL), Jorhat, has developed a new strain of Java citronella (*Cymbopogon winterianus* Jowitt) by chemical mutagenesis. Designated as RRLJOR-3-1970, this strain gives 30-35% higher leaf yield than the Jorhat strain which was released earlier for commercial cultivation in the north-eastern region of India.

Java citronella was introduced in the north-eastern India by the RRL-Jorhat in 1965 and since then extensive R&D work on this plant was carried out at the laboratory. In the first phase covering a period of 4 years from 1965 to 1968, studies were carried out on the influence

of various factors on the yield of leaf, and the yield and quality of oil under the agro-climatic conditions of the region and the selection of the strain with high yield of leaf and oil of desirable quality. Based on genetic variability, particularly in the tillering capacity of the plant, a new strain designated as 'Jorhat strain' was selected and studied during two seasons. This strain yielded 12.5 tonnes of fresh leaves per hectare with an average oil yield of 1.30% containing 40.4% citronellal, 28.5% geraniol, and 14.9% citronellol and geranyl acetate. The strain and the technical know-how were made available widely for commercial exploitation in 1969. By the end of 1975, this strain occupied as much as 2544 ha of commercial plantation in the region.

Work was taken up at the laboratory in 1970 for further improvement of the Jorhat strain by chemical mutagenesis. This study resulted in the development of the new strain designated as 'RRLJOR-3-1970'. Extensive trials at the laboratory and at Sepahijala (Tripura) and Yaongyimsen (Nagaland) over a period of three years established the superiority of this new strain over the Jorhat strain in a number of aspects. RRLJOR-3-1970 not only yields more (by about 37%) herbs than 'Jorhat strain', but also the herbs are richer (by about 10%) in oil content. The oil obtained from the new strain also contains more citronellal (46.2%) than that obtained from the 'Jorhat strain' (40.4%). The yield components such as plant height, number of tillers, number of leaves, length and width of leaves are found to be of a higher order in the case of RRLJOR-3-1970 than those of the 'Jorhat strain'.

This improved strain of Java citronella was formally released by Dr G. Thyagarajan, RRL-Jorhat's director, at a ceremony held at the laboratory on 8 November 1978. Dr Thyagarajan expressed the hope that the development of this improved strain would be another booster in commercial cultivation of Java citronella in this region.

The comparative characteristics of

the 'Jorhat strain' and 'RRLJOR-3-1970' are as follows:

	Jorhat strain	RRLJOR-3-1970
Average yield (kg/ha) of green herb (total of 4 harvests)	12,513	17,098
Average oil content (%)	1.32	1.45
Average yield (kg/ha) of oil (total of 4 harvests)	130	191
Citronellal content of oil (%)	40.4	46.2
Average height of plant in cm*	116.0	125.4
Average number of tillers*	80	85
Average number of leaves per plant*	410	441
Average length of leaves in cm*	62.4	73.8
Average width of leaves in cm*	1.54	1.73
*at seventh harvest		

Floristic Survey of Mandakini Valley

In a floristic survey of the Mandakini Valley of Uttar Pradesh, during 1972-77, Shri B.N. Mehrotra of the Central Drug Research Institute, Lucknow, studied 996 species belonging to 563 genera of 128 families of angiosperms, 3 families of gymnosperms and 10 families of ferns. He studied the (i) artificial key to the families, genera and species; (ii) salient morphological characters of each species; (iii) important synonyms and up-to-date nomenclature with phenological data; (iv) phytological affinities; (v) geology, soil and climate of the region; (vi) medicinal and economic importance; and (vii) conservation and protection of the endangered plant species; and screened the plants for their biological activities. He found that the flora comprised mostly herbaceous elements (70%). Two new species of plants, viz. (1) *Stellaria monosperma* Ham. ex D. Don var. *phataensis* Mehrotra var. nov., and (2) *Lonicera minutifolia* Kitamura var. *glabra* Mehrotra var. nov., were discovered by him. Shri Mehrotra has, for the first time, recorded two taxa from the West Himalayan tract, 20 taxa from the Garhwal Himalayas and 11 taxa from

Chamoli district. A species of lily has been found after a period of 132 years.

For his thesis based on these studies carried out under the guidance of Prof. B.S. Trivedi of Lucknow University, Shri Mehrotra has been awarded Ph.D. degree of the Lucknow University.

Geological Aspects of the Beaches of Goa

Some of the geological features of the beaches of Goa in relation to meteorological and oceanographic factors such as winds, waves, tides and currents were studied by Shri M. Veerayya of the National Institute of Oceanography (NIO), Goa. Shri Veerayya selected three beaches, viz. Calangute, Baina and Colva, situated in the central part of the coast of Goa, for his studies.

The investigations revealed the presence of well-defined cyclic changes in beach topography as well as in sediments during a year, characterized by a period of cut from April/May to August with less well-sorted coarse grained sands; followed by a period of fill from September to March/April with well-sorted fine grained sands, and the dependence of these on the varying wave climate associated with the seasonally varying wind pattern over the Arabian Sea. The beach at Calangute with relatively steep foreshore and coarse grained sediments presented large variations and was in equilibrium with the higher wave energy environment. This beach also showed higher susceptibility for slight changes in the wave climate. The beach at Baina enjoying greater shelter from the offshore islands and the promontories showed less significant variations in its topography and grain size of the sediments. This beach, however, followed the cyclic changes as in the case of Calangute. The Colva beach with its flat inshore bottom topography and fine grained sediments showed changes whose magnitude was relatively less than those of Calangute and reflected its equilibrium with low wave energy environmental conditions.

The studies indicated the importance of onshore winds in forming the aeolian deposits along this coast.

The observed variations with well-defined cyclicity of features along these beaches appeared to be governed not only by the nature of available material at these beaches, but also by the different environmental conditions. Studies on the overall configuration of the beaches and the sediment characteristics clearly indicated that these beaches generally neither loose nor gain any sediment even though the sand levels and grain size characteristics change from time to time to varying degrees depending on the energy fluctuations in the environments. These sediments would get recirculated within the beach bounded by the promontories under the influence of the prevailing currents and the associated circulation patterns in the surf zone.

For his thesis based on these studies, Shri Veerayya has been awarded Ph.D. degree in geology by the Andhra University, Waltair. The studies were carried out under the guidance of Dr V.V.R. Varadachari of NIO.

Drilling Rig Remounted on Diesel-Driven Vehicle

A Russian URB-2A rig mounted on a Russian petrol driven Zil truck was dismantled and remounted on a Leyland diesel chasis model ALCO (3/2, 4 × 4) at the National Geophysical Research Institute (NGRI), Hyderabad. Such a conversion, done for the first time in the country, will lead to reduction in the future running and maintenance costs, since diesel is cheaper than petrol and spare parts for Leyland truck are available in the country.

These drilling rigs are used in field for deep seismic sounding studies. The performance of this converted rig was highly satisfactory during the entire field work last year. Encouraged by its improved economics, NGRI has taken up work to convert another rig.

The dismantling and remounting were done by Shri J.K. Malhotra,

NGRI's Junior Driller, and his colleagues.

PROGRESS REPORTS

CIMAP Annual Report 1977-78

The main objective of the programme of work of the Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow, during 1977-78, was to strengthen the infrastructure and manpower for R&D work on cultivation and processing of medicinal and aromatic plants. The year saw a further increase in the laboratory's activity on research projects dealing with improvement of agrotechnologies and methods of processing of the plants. In all 45 projects were investigated and work on three projects was completed during the year. These facts were revealed by the annual report of CIMAP, for the year 1977-78 brought out recently. The report further reveals the following:

Efforts were made to introduce new strains of exotic medicinal plants and, for the first time, experiments were started for improvement of indigenous as well as exotic medicinal plants through plant breeding so as to improve the yield per hectare as well as the active constituents. Work on survey of diseases of medicinal and aromatic plants was intensified and experiments were carried out to develop suitable control measures for important plant diseases. A number of agronomic experiments, specially relating to soil fertility, were started at the headquarters and at the various regional centres so as to provide a package of improved fertilizer practices to the farmers for a number of crops. Investigations were also taken up to develop processing technology in those areas where the laboratory has proper expertise and where the raw materials were not being processed in the country, but exported in crude form.

A new strain of Ergot of Rye (*Claviceps purpurea* (Fr.) Tulasne) containing 0.72% total alkaloids and 0.4% ergotoxine was evolved. This strain

is much superior to the ergot available in the European market. Attempts were made to commercialize the technology at the farms of the laboratory in Kashmir Valley. Till now strain of ergot which was produced in the country as a result of the technology developed by CIMAP was chiefly meant for production of ergotamine. As formulations of ergotoxine group of alkaloids are of considerable importance, and the Indian pharmaceutical industry is in need of these, the strain was introduced and improved with a view to making the country self-sufficient in ergotoxine group of alkaloids. A high alkaloid strain of Egyptian Henbane (*Hyoscyamus muticus* Linn.) was introduced during the year and its performance testing was in progress.

As a result of initial selections in case of Japanese mint (*Mentha arvensis* Linn.), a few clones were isolated, and these contained more than 3-4% oil on dry-weight basis and more than 80% menthol content, as compared to 2-2.5% oil content and 65-70% menthol content of the cultivated strain. Similarly, some clones of palmarosa containing more than 1% oil in the whole plant and 1.5% oil in the flowering tops with 93% geraniol content have also been selected. These clones are much superior to the wild clones being cultivated so far and having 0.5-0.6% oil content and 80-85% geraniol content. The laboratory plans to test these clones in different regions of the country during the next cropping season and hopes to release in the next two years a variety with high oil content and better quality of oil. Once such a variety is cultivated on large scale, India will be able to re-enter the international market which has been lost to central American countries because of the poor quality of oil extracted from the wild grass.

A four-hectare pilot-scale plantation of *Dioscorea deltoidea* Wall. was raised in Kashmir Valley. If this pilot-scale trial is successful, it will be possible to raise this plant on farmers' field so as to have a consistent supply of raw material for diosgenin which is mostly obtained from

the wild growth in the forests of Jammu & Kashmir and Himachal Pradesh.

A fertilizer schedule for hops was developed as a result of investigations carried out on effect of fertilizers in Kashmir Valley. A model hop yard was also developed at Manasbal Farm and hops worth more than Rs 45,000 were produced at this plantation during the year under report. Initial experiments on introduction of lavender (*Lavandula officinalis* Chaix) and clary sage (*Salvia sclarea* L.) were laid out. The oil of the two plants is now imported from abroad to meet the requirement of the indigenous perfumery and cosmetic industries. But, these experiments have established that these plants can be cultivated in Kashmir Valley. Suitable strains of these two crops were introduced and it is expected that indigenous agrotechnology for commercial production of these crops will be developed in the next three years.

A simple laboratory process for production of ephedrine from *Ephedra* growing wild in Ladakh region was developed at the regional centre, at Jammu & Kashmir. A laboratory process developed for isolation of colchicine from *Gloriosa superba* L. was scaled up on pilot-plant scale with a yield of 0.06-0.08%. It is expected that this project will be completed during the next year. A process for production of total alkaloids of *Catharanthus roseus* (L.) G. Don was also developed at the Bangalore Regional Centre. A trial on semi-commercial scale was being carried on at the laboratory's Drug Factory at Jammu.

A detailed survey for selecting high diosgenin clones of *Costus speciosus* Sims in different parts of the country was completed and some high diosgenin clones having more than 4% diosgenin were identified. Survey on the availability of *Dioscorea deltoidea* yielded some very useful results. Previous reports showed that *Dioscorea deltoidea* available in U.P. was too low in diosgenin content and unfit for commercial processing. The present survey indicated that about 400 tonnes of dried rhizomes

could be obtained every year. Diosgenin content of rhizomes in different ranges of Kumaon and Garhwal hills varies from 2.5 to 4%. Rhizomes from certain areas of Uttar Kashi District are much better; here diosgenin content goes up to 3-6%.

The headquarters of the institute which was housed in the campus of the National Botanical Research Institute, Lucknow, so far, shifted temporarily in June 1977 to a spacious building at Sitapur Road, Lucknow, till its own building at Kukrail is completed. The work of the headquarters was re-organized and the following disciplines started functioning: (1) Botany and Pharmacognosy; (2) Phytochemistry; (3) Plant Pathology; (4) Information, Liaison and Extension including Library and Art & Photography; and (5) Essential Services.

A field laboratory was also set up at the Kukrail Research Station with the following disciplines: (1) Agronomy and Soil Science; and (2) Genetics and Plant Breeding.

A Mycology Laboratory for large scale production of ergot culture was set up in Jammu. Twenty thousand culture bottles for inoculation of 160 ha of rye crop were prepared.

A new regional centre of CIMAP started functioning in Tamil Nadu since October 1977. Forty hectares of forest land was taken over in the Berijam Lake area near Kodaikanal. Another regional centre was established at Anselgunj in Darjeeling District (West Bengal) in March 1978.

Technologies developed by the laboratory were transferred to about 700 parties. As a result of transfer of technology, the country saved Rs 7 crore in foreign exchange. In addition, CIMAP itself produced medicinal plants, essential oils and their preparations worth Rs 60 lakh.

There was appreciable improvement in the overall performance of the laboratory's farms and factories during the period under report. The total production during the year was to the extent of Rs 55.52 lakh as against Rs 51.96 lakh during 1976-77. There was

significant increase in production of ergot, belladonna and pyrethrum. The overall surplus was Rs 2.4 lakh.

PERSONNEL NEWS

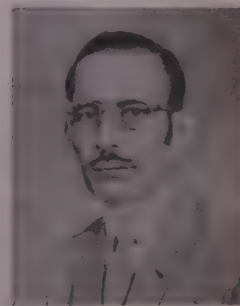
Appointments/Promotions

The following have been appointed at the National Environmental Engineering Research Institute (NEERI), Nagpur: Shri Santosh Kumar (Section Officer, NEERI Headquarters; 1 Jan. 1979); Shri V. Arumugam (Scientist B, NEERI Headquarters; 1 Jan. 1979); Shri V. Haraprasad (Scientist B, Delhi Zonal Laboratory; 3 Jan. 1979); and Dr T. Swaminathan (Scientist B, NEERI Headquarters; 26 Feb. 1979).

Honours & Awards

FICCI Award for Prof. Harsh Vardhan

Prof. Harsh Vardhan, Director, Central Scientific Instruments Organisation (CSIO), Chandigarh, has been awarded (jointly with Prof. M.A. Pai of the Indian Institute of Technology, Kanpur) the Federation of Indian Chambers of Commerce and Industry (FICCI)



Award in science and technology for the year 1978 in recognition of his outstanding contributions to technology with particular reference to its interaction with industry. The award carries a cash of Rs 10,000 which has been shared by the two awardees.

Under the stewardship of Prof. Harsh Vardhan CSIO has undertaken several highly sophisticated and prestigious projects of national importance of which mention may be made of those on scanning electron microscope, electronic scoreboard and portable digital multimeter. CSIO's repair and maintenance network in the country has also expanded. With his firm view that a fully engineered know-how is necessary for its transfer to industry—because, only a

few established firms in the country are equipped to translate a laboratory prototype to an industrial unit, whereas, the R&D institute, with a little extra effort, can convert the laboratory prototypes to fully engineered ones—Prof. Harsh Vardhan has led CSIO to help the industry, especially the small scale industry, to a great extent. Almost all the know-hows developed since Prof. Harsh Vardhan's joining of CSIO are well engineered to commercial standards.

CSIO is now regarded as a premier institution for training in the field of instrument technology. Recently, with the personal interest of Prof. Harsh Vardhan, a course on 'Industrial electronics' and another on 'Die and mould making' have been introduced at the Indo-Swiss Training Centre of CSIO.

Prior to his present assignment, Prof. Harsh Vardhan served the Defence Science Laboratory (DSL) and the Indian Institute of Technology, Delhi. At DSL, Dr Harsh Vardhan undertook the development of a high speed photographic equipment and the setting up of the country's first shock tube, both of importance in defence research. The high speed camera designed and fabricated by him won him the Inventions Promotion Board Award in 1966. The technique of making replica diffraction gratings was established by him, this was later extended for commercial production. In 1963, his services were availed of by the Solid State Physics Laboratory which was being established at that time.

The development of a method for the purification of silicon to transistor-grade purity and setting up a pilot plant for its production are also due to the efforts of Prof. Harsh Vardhan. He established the techniques of photolithography and mask making for thin film integrated circuits. Several thin film circuits, including those for an audio-amplifier, a radio receiver (of the size of a cigarette carton), and multivibrator were made by him.

Prof. Harsh Vardhan equipped a

special laboratory for SIC work and created clean room facilities. Techniques of masking, opening of windows, diffusion, coating and attaching the leads, etc. to desired dimensional specifications were established. Interstitial images and complicated dial scales were produced for the first time in the country. Techniques of manufacturing button type sealed nickel-cadmium cells, cadmium sulphide photoconductors, etc. were developed.

At the Indian Institute of Technology, Prof. Harsh Vardhan's assignment was to establish an Instrument Design Development Centre with the objective of designing and developing sophisticated instruments for teaching, research and industry. Under his headship the Centre acquired, in a year's time, a well equipped optical shop and testing laboratory, an electronic and electrical division, industrial design laboratory and a comprehensive workshop.

Dunlop Award for Dr Ghatge

Dr N.D. Ghatge of the National Chemical Laboratory (NCL), Pune, has been awarded (along with Shri B. Banerjee of the Indian Rubber Manufacturers' Research Association) the first Dunlop Award (1978) of the Dunlop India Ltd. Instituted by Shri M.M. Sabharwal of the Dunlop India



Ltd, the award carries cash prize of Rs 10,000.

A brief account of the prize-winning work of Dr Ghatge is given below.

Ghatge synthesized and characterized three monoisocyanates, viz. 4-isocyanatodiphenyl ether, 2-isocyanatodiphenyl ether, and 4-isocyanatoazobenzene. These monoisocyanates were polymerized using basic as well as acidic catalysts. Basic catalyst produced Nylon-1 type polymers. Ghatge and his group prepared new coloured polyamides from 4-isocyanatoazobenzene by this method

and found them to be compatible with Nylon-6.

Studies carried out by Ghatge revealed that monoisocyanates from diphenyl ether type compounds, produce, on homopolymerization in the presence of acidic catalysts, polyamide polymers containing amide groups. This is an entirely new route for the synthesis of polyamides. It is possible to produce tough nylon fibre by this route.

Ghatge synthesized 3,3'-sulphonylbis(phenyl isocyanate) [3,3'-SDI], and 3,3'-methylene-bis(phenyl isocyanate) [3,3'-MDI] and studied their reactivities. 3,3'-Dinitrodiphenyl sulphone, a byproduct obtained in the manufacture of *m*-aminophenol, was utilized for the preparation of these diisocyanates. These diisocyanates have been utilized for the vulcanization of polyurethane elastomers. Ghatge also vulcanized natural rubber with the adducts prepared from diisocyanates and *p*-nitrosophenol.

Ghatge and his group prepared thiol terminated esters from polyhydroxy compounds and thioglycolic acid. These thiols were used for the preparation of polythiourethanes. Rubbery products were obtained from castor oil-thioglycolates.

Ghatge synthesized the following three sulphenamides: N-cyclohexyl-N-phenyl-2-benzothiozolesulphenamide (CPBS); N,N-diphenyl-2-benzothiozolesulphenamide (DPBS); and N-methyl-N-phenyl-2-benzothiozolesulphenamide (MPBS). These sulphenamides were then evaluated as secondary accelerators in styrene-butadiene rubber.

The synthesis of new reactive resins based on phenol formaldehyde type resins was studied by Ghatge using CNSL (cardanol) for use in natural and synthetic rubbers. These reactive reinforcing resins are: novolak resins modified with diisocyanates; resol resins modified with butanol, isocyanates and rosin (one of the rosin-modified phenolic resin was found suitable for use in adhesive tapes); 3-pentadecenyl-phenoxyacetic acid (prepared from

cardanol and polymerized to dimer acid which was used in the preparation of polyamide resins); and epoxy novolak resins (prepared from cardanol and dimerized cardanol and evaluated in surface coatings for various applications).

Dr Ghatge was honoured along with his student with a gold medal by the All India Rubber Industries Association in 1972 for the effective vulcanization systems for rubber developed by him.

ICAR Prizes for NBRI Scientists

Dr M.I.H. Farooqui and Shri R.K. Tandon of the National Botanical Research Institute, Lucknow, have been jointly awarded 'Kheti Puraskar' in agricultural sciences for the year 1977-78 by the Indian Council of Agricultural Research, New Delhi, for their article titled 'Gramin Vikas ke liye Beej Gond Udyog' (published in the May 1977 issue of 'Kheti'), which was adjudged the best article.

Dr Asghar Husain

Dr Asghar Husain of the Regional Research Laboratory, Hyderabad, has, on invitation, worked as a Visiting Professor at the Department of Chemical Engineering, McMaster University, Hamilton, Canada, from 1 August 1978 to 28 February 1979. Dr Husain offered a graduate course on variational calculus and applications of variational methods of optimization in chemical engineering. He also participated in the research programme on Digital Computer Process Control.

Dr Husain presented two seminar lectures on 'Modelling and simulation of ammonia converter' at the McMaster and the Waterloo universities (on 22 Nov. 1978 and 20 Feb. 1979 respectively). This work was earlier presented at the 1978 Summer Computer Simulation Conference held at Newport Beach, California (July 1978). The work generated a lot of interest, particularly with respect to the result obtained from the simulation study that an optimum H_2/N_2 feed ratio

can enhance the converter efficiency by at least 3% which can be quite substantial for high tonnage ammonia production from the petroleum feed stock.

A monograph titled 'A Collection of Computer Programs for Optimization', edited by Dr Husain, has been brought out by the Faculty of Engineering, McMaster University. This monograph (Pp. about 200) lists 22 tested Fortran Programs for applying various methods of function and functional optimization. [Copies of the monograph (Publication No. SOC-221) are available from McMaster University, Hamilton, Canada].

Transfers

Shri B.N. Sahai has joined the Publications & Information Directorate, New Delhi, as Section Officer, on transfer from the CSIR Headquarters, New Delhi (2 April 1979).

PATENTS INFORMATION

Indian Pat. 2181/Cal/75*

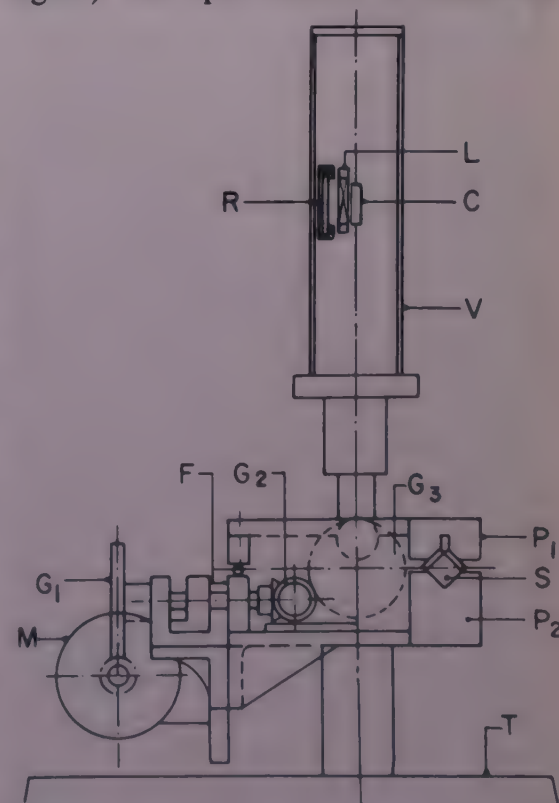
A traversing mechanism for imparting uniform linear motion to crystals and photographic plates or films in X-ray topography camera or similar equipment

KISHAN LAL, D.R. PAHWA & VIJAY KUMAR
National Physical Laboratory, New Delhi

Single crystals are being widely used in solid state devices. The performance of these devices strongly depends on the perfection of the single crystals, besides on other factors. Therefore, a lot of research work has been done to evolve methods for evaluation of crystalline perfection. These methods include electron microscopy, field emission microscopy, etch pit method and X-ray diffraction topography. X-ray diffraction topography is a non-destructive technique for direct observation and characterization of defects like dislocations. As a result of the efforts made at the National Physical Laboratory (NPL), New Delhi, to develop a complete X-ray topography arrange-

ment, an X-ray diffraction topography camera and a microfocus X-ray generator have been developed. One requires, as a part of this experimental set up, an instrument which can provide uniform and smooth linear motion to the specimen crystal and the photographic plate. To meet this requirement a traversing mechanism has also been developed at NPL.

The figure (below) gives a sectional diagram of the traversing mechanism covered under this patent. The mechanism consists of two plates P_1 and P_2 . P_2 is a base plate which remains stationary and is fixed to a suitable turntable. The upper plate P_1 is movable. It moves on a square rod S placed on one end of P_2 and a flat plate F which is fixed on the other end of P_2 . P_1 and P_2 are coupled through a carefully ground screw and nut assembly. The motion is provided with the help of a synchronous motor M whose speed is reduced with the help of a series of gears G_1 , G_2 and G_3 . The direction of motion is reversible so that to and fro linear motion can be imparted to the plate P_1 . The position of the plate P_1 is monitored with the help of a digital counter (not shown in the figure). The span motion is controlled



Sectional diagram of the traversing mechanism for X-ray diffraction topography camera developed by NPL, New Delhi

*Accepted

with the help of two microswitches fixed one each at the ends of the square rod (not shown in the figure). The specimen crystal C to be investigated is fixed in a suitable vertical circle goniometer V which is fixed on the top of P₁. A suitable photographic plate is also fixed on the top of P₁. A slit L is introduced between C and R so that only diffracted X-ray beam is recorded on R and a direct beam is stopped by it. When the motor is energized the top plate P₁ moves to and fro in the range governed by the size of the crystal C and adjusted by the microswitches.

This system has been in operation at NPL for the last few years. Several hundred topographs have been recorded by the system for institutions in India and outside.

Indian Pat. 1437/Cal/76*

Process for the preparation of flame-retardant and water-resistant bitumen

S.R. DUTTA CHOUDHURY, V.S.B. RAO, A.C. KHAZANCHI & B.P. CHALUHA

Regional Research Laboratory, Jorhat

The patented process relates to the preparation of flame-retardant and water-resistant bitumen from cheap and indigenously available raw materials. Raw materials required in the process are bitumen, 'Aromex' (a byproduct obtained in the refineries by the liquid sulphur dioxide extraction of straight-run kerosene), trichloroethylene and chlorine gas. Bitumen and Aromex are mixed in the optimum ratios, catalyst is added, and the desired fire and water resistivity properties are achieved by controlled chlorination. Trichloroethylene used as diluent is recoverable. The final flame-resistant composition is prepared by incorporating antimony oxide in the chlorinated product.

The objective of the invention is to prepare a cheap water-resistant and fire-retardant product for boards made out of paper pulp used in low-cost housing and to develop a formulation for fire-retarding thatch-roofing for rural

houses. Test paper houses constructed in the laboratory with the product formulated showed satisfactory results.

PATENTS FILED

299/Del/78: Development of backing strip (non-metallic) for welding, S.P. Gupta, S.K. Bhattacharya, B.N. Misra and S.K. Karmakar—CMERI, Durgapur.

931/Del/78: A process for the preparation of a carrier vehicle with controlled gelling time to deliver tubal occluding agents, R.C. Nandi, S. Singh, J.P.S. Sarin, B. Malviya, Harish Chandra and N.M. Khanna—CDRI, Lucknow.

948/Del/78: Improvements in or relating to fast response, linear, ocean temperature measurements, S.G. Diwan, V.B. Peshwe, C. Rameshu, N.R. Nayak & E. Desa—NIO, Goa.

949/Del/78: A process for applying very thin film of copper ruby (or other coloured) glass over colourless (or opal) glass body for producing improved type of cased glassware, S.N. Prasad, S. Sensarma & N.N. Das—CGCRI, Calcutta.

951/Del/78: Electrochemical preparation of saturated aliphatic amines dodecylamines and octadecylamine using black nickel cathodes, H.V.K. Udupa, V. Krishnan & N. Mahalingam—CECRI, Karaikudi.

961/Del/78: Preparation of high purity graphite, K.S. Narasimhan & P.K. Jena—RRL, Bhubaneswar.

971/Del/78: A process for the preparation of a detonator cap sensitive explosive composition, A. Bagchi, B.K. Barman, P.K. Dutta & S. Bagchi—CMRS, Dhanbad.

972/Del/78: Improvement in or relating to the manufacture of short wave magnetic cores, G.C. Jain, B.K. Das, H.S. Kalsi, R.S. Khanduja, S.K. Sharma, T. Podikunju & J.L. Sootha—NPL, New Delhi.

974/Del/78: Process for the preparation of anhydrous acetic acid from its aqueous solutions, A. Mirza & S.V. Rao—RRL, Hyderabad.

Errata

In the 'Patents Filed' column in CN, 29 (1979), 40, under 794/Del/78, please read: Diaphragm pump, H.J. Patil—NEERI, Nagpur.

PATENTS SEALED

44/Del/76 (145480): Reaction-type soldering flux, S.K. Bhattacharya & A.K. Ray—CMERI, Durgapur.

1776/Cal/76 (144937): Improvements in or relating to the preparation of strychnine and brucine alkaloids from extract obtained from *nux vomica*, C. Srinivasulu, S.R.S. Sastri, K.S. Narasimhan & S.N. Mahapatra—RRL, Bhubaneswar.

2552/Cal/74 (143356): An electrolytic cell for anodic oxidation of conductors/semiconductors, B.D. Tyagi & S.K. Bhatnagar—CEERI, Pilani.

Directory of the Indian Ocean Region

The National Institute of Oceanography, Goa, has completed and released for the United Nations Environment Programme (UNEP), a Directory of the Indian Ocean Region. The directory gives a comprehensive account of almost all the institutions in 13 countries in the Indian Ocean region, viz. Bangla Desh, Burma, India, Indonesia, Malagasy Republic, Malaysia, Mauritius, Pakistan, Philippines, Seychelles, Singapore, Sri Lanka and Thailand. It contains details of the capabilities of 79 institutions in the field of marine science. It also includes particulars of about 1040 marine scientists in the Indian Ocean region together with a list of publications (totalling 1013) from 1972 to 1976.

The first of its kind for the Indian Ocean region to be produced for any specialized agency of the United Nations, the directory will be periodically updated by NIO which carried out the entire work of its preparation.

*Accepted



Production and Utilization of Forest Products Symposium at RRL-Jammu

A three-day symposium on Production and Utilization of Forest Products was organized by the Regional Research Laboratory (RRL), Jammu, during 5-7 March 1979. Panel discussions on 'Present status and problems of wood-based industries in India' and 'Problems of rosin, turpentine and pine products industry in India' were a feature of the symposium. The panel on wood-based industries observed that full utilization of the vast wood resources of the country was not being done owing to lack of data on their availability. Suggestions were made for greater R&D efforts in the field and for increasing resources by raising man-made forests. The panel on rosin, turpentine and pine products discussed the problems faced by the producing sector as well as the consumer. Among the main recommendations made were for: (i) improvements in methods of tapping; (ii) use of better containers for storage and transport; (iii) improvements in chemical processing to avoid losses; and (iv) improvements of resources through surveys, and introduction of new varieties of pine. The panel urged RRL-Jammu and the Forest Research Institute, Dehra Dun, to take up projects in this field to boost production of pine oleoresin, specially in Uttar Pradesh, Himachal Pradesh and Jammu & Kashmir.

One hundred and twenty-three papers were included for discussions during seven technical sessions; Rosin, turpentine and essential oils; Gums, tannins and cutch; Cellulose and pulp;

Forest-based industries; Oil seeds; Medicinal and miscellaneous products; and Resources and management. Five special lectures were delivered on: (i) Indian plant gums and their applications (by Dr H.C. Srivastava of the Ahmedabad Textile Industry's Research Association, Ahmedabad); (ii) Cultivation of medicinal plants in West Bengal (by Dr S.K. Chatterjee, Director, Cinchona and Other Plants, Government of West Bengal); (iii) Rosin, its derivatives, their chemistry and potential for industrial utilization (by Shri S.N. Mehra, Chief Chemist, Camphor and Allied Products Ltd); (iv) Forestry management in India—New directions (by Prof. A.R. Maslekar of the Indian Institute of Forest Management, Ahmedabad); and (v) Forest Survey of India—An approach to build data bank for the development of forest-based industries (by Shri C.L. Bhatia, Chief Coordinator, Pre-investment Survey of India).

The symposium was inaugurated by Shri D.D. Thakur, Minister for Finance and Industries, Jammu & Kashmir, who, in his inaugural address, stressed the need for making the forest areas easily accessible for better and fuller exploitation. The minister said that a judicious exploitation of forest wealth may indirectly help grow and conserve forests. The realization by the people that the forests are an unending source of income could create conditions for stopping indiscriminate denudations. This might also encourage large-scale forest plantations on private land.

Stressing the need for an alternative to the use of wood as fuel, Shri Thakur emphasized the role of research institutions in this connection.

Earlier, Dr C.K. Atal, Director of the laboratory, stressed, in his welcome address, the need for developing forest-based raw material resources for the industry. He suggested the raising of manmade forests to meet the shortage of fossil fuels and other energy sources. He also drew attention to the need for diversification in commercial utilization of the raw materials. Referring to the pulp and paper industry, which consumes large quantities of long-fibred wood, Dr Atal mentioned the recent technological advances which make possible the use of short-fibre woody materials for making comparable pulp and paper products. In so far as veneer and plywood industry is concerned, Dr Atal said that half of the expensive wood remained unutilized and substantial savings could be effected if the unused wood was employed in the manufacture of panel products side by side. Dr Atal made a special reference to the possibilities of producing various chemicals from forest raw materials. Some of these, especially gums, resins, latex products, aromatic materials and tanstuffs, were already being employed to some extent. He suggested a fuller assessment and systematic exploitation of the minor forest products whose value ran into crores of rupees. He made a plea

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Dr C.K. Atal, RRL-Jammu's director, welcoming the delegates to the symposium on 'Production and Utilization of Forest Products'. Seated on the dais are (from left): Shri C.L. Bhatia, Chief Coordinator, Pre-investment Survey of India; Dr K. Bhattacharya, Minister for Commerce & Industries, West Bengal; Shri D.D. Thakur, Minister for Finance & Industries, Jammu & Kashmir; Prof. C.N. Haksar, Advisor to RRL-Jammu; and Dr Y.K. Sarin Coordinator, SYMFOR 79

for collective efforts by the various agencies involved in the production and utilization of forest products.

The keynote address by Shri B.P. Srivastava, Inspector General of Forests (read out by Shri P.G. Deshmukh, Deputy Chief Conservator of Forests, Madhya Pradesh) gave an overview of the forestry situation in India and the present raw material consumption and future requirements. It also described the status of raw material requirements of small-scale forest-based industries and a more rational policy for utilization of forest products. The paper dealt in detail with the present consumption and future requirements by paper and pulp, plywood, panel products and matchwood industries. It also mentioned the worldwide interest in non-wood forest resources such as resin and gums, tannins, oilseeds and other minor forest products owing to the increased demand and the growing interest of urban society in the use of natural products. It stressed the need for integration of the producing sectors and manufacturing sectors in order to develop a policy of rational and optimum utilization of forest resources.

Recommendations

In the concluding session held on 7 March 1979 under the chairmanship of Prof. C.N. Haksar, Advisor to RRL-Jammu, the following recommendations were made:

Detailed studies should be carried out to ascertain the present status and problems of forest-based industries.

There is a great need for R&D work on the preparation of modified gums, so as to derive a greater monetary value from the available raw materials.

In view of the overall shortage of industrial and edible fatty oils, efforts should be made to search for more oil-yielding species.

More emphasis should be laid on the collection and processing of medicinal herbs in rural areas.

Requirements of timber and firewood of the rural people should be found out and action taken to meet their requirements.

All existing and prospective entrepreneurs should be requested to register themselves with the concerned state forest departments to facilitate release of raw materials.

A minimum of 2% of the revenue obtained from the supply of raw materials may be earmarked for R&D.

A data bank should be established to provide data on past trends of consumption, present availabilities and requirements and future demands for all major and minor forest products.

More effective measures should be taken to protect forests from fires, diseases and pests by adopting latest technology.

A germplasm collection centre should be established with a view to introduc-

ing tree species of economic and industrial value. This centre should be on lines similar to the National Bureau of Plant Genetic Resources.

Extension plantations of fuel, fodder and industrially important species should be raised.

There is a strong need for educating the rural masses, and special extension wings may be created in the existing forest departments.

Forestry should be taught as a subject right from the primary level of education and forest botany and natural history should find a distinct place in the teaching of botany at the higher secondary, college and university levels.

The symposium was attended by 176 delegates representing research organizations, technological institutes, forest departments, industries and cooperative bodies. The Tropical Products Institute, London, was also represented. The West Bengal minister for industries and commerce (Dr K. Bhattacharya) and Jammu & Kashmir's minister for forests (Shri M.K. Tikoo) also took part in the deliberations.

NIO's Work Presented at Orleans Seminar

The results of offshore mineral explorations carried out by the National Institute of Oceanography (NIO), Goa, were presented, on invitation, at a

seminar on offshore mineral resources held at Orleans, France, during 23-27 October 1978. Organized by the Groupe d'Etude et de Recherche de Mineralisations Au Large and the Bureau de Recherches Geologiques et Mineres, the seminar was attended by 200 participants from 22 countries. Methods used by NIO for exploring heavy mineral placer deposits evoked considerable interest among the participants, particularly those from the developing countries. In the proceedings of the seminar (issued in February 1979) NIO's contribution was summed up as "an interesting picture of the present status of exploratory work on India's vast continental margins, an area with distinctive tropical and sedimentary features". India's continuous and coherent efforts to explore and assess her surface mineral resources by herself were also appreciated in the proceedings.

NPL Develops Crystal Puller for Growing Single Crystals

A versatile crystal puller for growing single crystals of materials having high melting points has been designed, developed and fabricated by the National Physical Laboratory (NPL), New Delhi. The device utilizes Czochralski technique of growing single crystals from the melt. In this technique the material to be grown as a single crystal is held in molten state near its melting point. A seed crystal is dipped into the melt so that crystal growth takes place around the seed. The seed is rotated and pulled up slowly. Good quality crystals of large sizes can be grown by this technique.

The crystal puller

The crystal puller is shown in Fig. 1. The charge is held near melting point in the furnace F and the seed (not shown) is attached to the lower end of the pull rod P which is attached to a seed rotation

assembly SRA. The seed rotation assembly is fixed to the nut part of a screw and nut assembly A. The screw S rotates and the nut N fixed in A translates along a vertical direction. This movement is guided by one rod of square cross-section SR and another rod of circular cross-section CR. The guiding surfaces of the first rod are plane within 5μ over its entire length of nearly one meter. The output of a variable speed motor M is reduced through a reduction gear box RG whose output is used to drive the screw S. The motor M and gear box RG are mounted on a common platform, which is isolated from the base with the help of special

anti-vibration mountings. In this way, transmission of vibrations from the motor to the puller is greatly reduced. The crystal puller rests on special anti-vibration mounting to isolate it from the vibrations in the ground. CM is the control for the motor M which controls the rate of pulling. The motor and the gear assembly give a stepless variation of the pull rate in the range 2-20 mm/hr. The total length of the pull available is about 60 cm, though with the presently available heating facilities the pull of crystals is limited to about 10 cm. PS is the power supply for the furnace.

The crystal puller is being tested for mechanical performance, i.e. uniformity

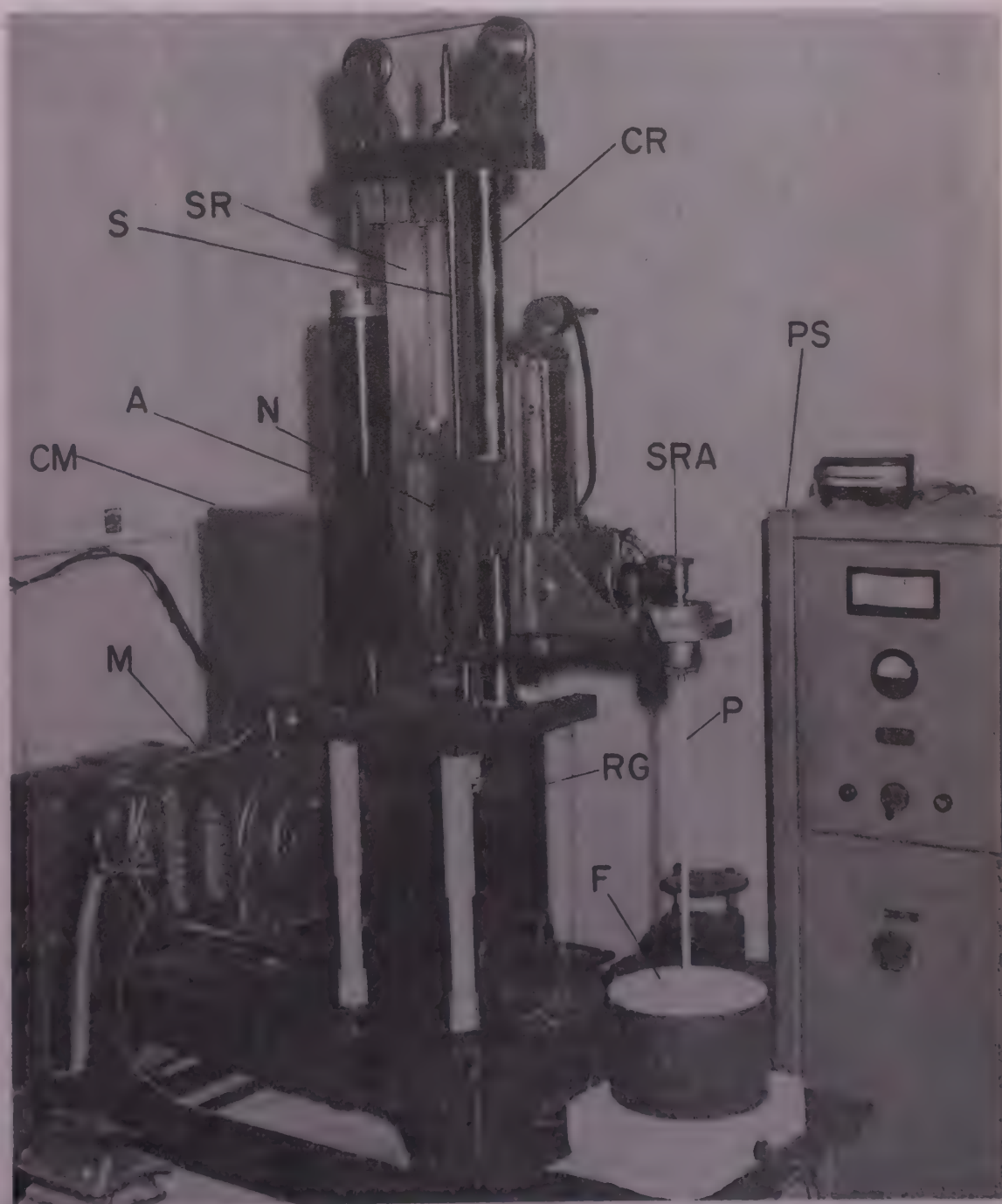


Fig. 1 Crystal puller developed at NPL, New Delhi



Fig. 2 Some typical alkali halide crystals grown with the NPL crystal puller

and smoothness of pulling motion. A large number of single crystals of alkali halides like KCl and KBr have been grown. A sample of the crystals grown with this equipment is shown in Fig. 2. A good control of the crystal diameter has been achieved. Presently the temperature is being controlled manually; the temperature stability is about 1°C at 800°C .

Perfection of some of these crystals has been tested on the triple crystal X-ray diffractometer—another sophisticated instrument designed and developed at NPL. With this instrument, absolute rocking curves corresponding to X-ray diffraction from a desired set of lattice planes can be recorded. From the shape of the rocking curves, particularly from the width of these curves, perfection of the crystal can be evaluated. The crystals grown with the NPL crystal puller show fairly big regions which diffract X-rays in the same manner as the nearly perfect dislocation-free single crystals of silicon. The half-width of a typical diffraction curve of KCl crystals grown at NPL has been found to be 16 seconds of arc which is very close to that expected from nearly perfect single crystals, and, in one of the samples, half-width of just 9 seconds of arc has been observed. Some of these crystals give rocking curves having a width of 24 seconds of arc over the entire area. This is about two orders of magnitude better than that reported so far.

With further improvements in this puller, viz. addition of an automatic temperature control and of facilities like a 25 kW output RF generator, presently being planned, it will be possible to use the puller to grow single crystals of oxides like garnets and tungstates also.

NRDC-CSIR Processes

The Annual Report of the National Research Development Corporation of India (NRDC), New Delhi, for the year 1977-78, published recently, reveals that out of the ninety processes/products referred to it by various organizations during the year, 57 processes/products were the result of the work of CSIR laboratories.

The contribution from the National Physical Laboratory, New Delhi, was maximum with 10 processes. The National Chemical Laboratory, Pune, and the Central Scientific Instruments Organisation, Chandigarh, contributed eight processes each.

The report further reveals that out of the 165 licences negotiated by NRDC for commercial exploitation, 141 licenses related to processes from CSIR laboratories. Thirty out of the 33 technical notes issued to the industry related to CSIR processes.

NRDC's earnings through premia and royalty during the year amounted to Rs 15.4 lakh and Rs 45 lakh respectively. Out of these, CSIR's shares were Rs 13.7 lakh and Rs 43.6 lakh respectively.

PROGRESS REPORTS

CMRS Annual Report 1977-78

During 1977-78, the R&D activities of the Central Mining Research Station (CMRS), Dhanbad, were concentrated on 309 sponsored projects and nine grant-in-aid projects; out of these, 132 projects were completed. Besides, more than 40 projects were carried out by the laboratory on its own. These statistics are revealed by the laboratory's annual report for 1977-78 brought out recently. The report also reveals that CMRS investigated problems related to roof weighting and associated air blast, surface subsidence; strata control; roof bolting; roof stitching, stability of workings, barrier, slope and slided mass; and causes of collapse. The laboratory also investigated the support requirements of a number of longwall faces, and feasibility of extraction under various surface features and underwater body. Design for new stowing plants was provided to various mine managements. Survey on ventilation, dust and air pollutions as also on cases of lead poisoning was conducted. Planning for new ventilation was also done. Fume characteristics of explosive, incendivity of explosive cartridges, influence of cartridge materials on the incendivity of slurry explosive and surface failure of various mining components were investigated. The influence of various geological factors on strata control at the Lachipur Colliery in Raniganj coalfield was being studied. The study would be helpful in the design of supports.

A telescopic type cross-bar was designed for immediate support in development galleries where conventional supports are dislodged because of blasting. It consists of two clamps which are fixed in holes drilled on both sides of pillars. The telescopic beam which can be adjusted depending on the width of a gallery can then be fixed over the clamps and tightened against the roof with wooden wedges. It takes only 10 min. to set up the support,

and it can be recovered easily for re-use. Extensive field trials carried out at Chinakuri, Dhemo Main and Central Jamuria coal mines have proved its suitability as temporary support and confirmed that it could take a load of two tonnes.

The reinforcement of an inclined fractured plane and the relative magnitude of shear resistance offered by it were studied. It was found that wire rope and bolts with interconnecting steel strap systems can provide significant increase in resistance against shear failure along a fracture plane.

Studies related to bacterial oxidation of methane were continued. *Methanomonas methanica* was grown in Kaserer's media and bacterial activities were investigated. The bacterial leaching of chalcopyrite with *Thiobacillus ferrooxidans* and *Thiobacillus thiooxidans* adapted to the concentrations of 0.02-0.03 M and 0.001-0.006 M respectively of copper sulphate was also studied.

A method for predicting the life of a rope wire having micro cracks on its surface has been evolved. This method requires determination of crack propagation susceptibility (CPS) value from a knowledge of depth and length of crack and the diameter of the wire. The CPS value is then treated as an index for predicting the life of the rope wire.

One unit of central despatcher system manufactured by Westinghouse Saxby Farmers Ltd, Calcutta, on the basis of CMRS know-how, has been installed at Bhanora coal mine of the Eastern Coalfields Ltd. The equipment has facilities of loud hailing, indication of 'on and off' condition for all mine machinery and a digital display of empty tubes in mines, miners working underground, etc. The system also incorporates a manually operated exchange with sound powered telephones for two-way communication from various places at surface and underground.

A dust respirator has been developed at CMRS for providing safety against dust hazards and the design has been released to a firm for commercialization.

The laboratory completed the design and development of an ammonia gas mask. A gas canister was designed and developed for use against halogen, sulphur dioxide and oxides of nitrogen.

An inorganic based, noncombustible adhesive has been developed for making any surface leakproof. Autooxidation of coal can be checked by applying it over coal surface. Ventilation of a mine can be improved by applying the adhesive over a stopping. Field trials of the sealout were continued.

CMRS also carried out chemical analysis of minerals, alloys, oil, water, mine dust and gas. Physicomechanical properties of coal and rock samples were determined. Testing of flameproof

electrical equipment, intrinsically safe equipment, explosives, detonator, wire rope and other mining components, gravimetric dust sampler, self rescuer and soda-lime was carried out. A powdery ammonium nitrate-based explosive of group P₁ permitted type has been formulated and was undergoing storage trials.

Three patents were filed during the year. A process relating to remote indicating hydraulic load cell was released through the National Research Development Corporation of India to Progressive Machine Tools, Jaunpur. Fifteen processes relating to design and development work were released to different firms on sponsored basis.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Fibre Glass

The Central Glass & Ceramic Research Institute (CGCRI), Calcutta, has developed a technology for the production of fibre glass in small scale sector with an investment of a few lakhs of rupees. Till today, only large units have been manufacturing fibre glass in the country with foreign collaboration involving capital investments of several crores of rupees. The technology developed by CGCRI is economically viable as well as appropriate for the country.

Fibre glass is used for the manufacture of reinforcement fibres in the form of rovings, diamond woven mat and chopped strands using commercially available neutral glass rods as the starting material. Fibre glass reinforced plastics are used in transport industry, production of containers, furniture, chemical plants and equipment, pipes, etc.

Fibres in composite specimens have been prepared using these fibres in the form of diamond woven mat and polyester resin, and have been tested at the laboratory and also at the Vikram Sarabhai Space Centre, Trivandrum.

The specimens are 2.5-3 times stronger than those prepared from commercial chopped strand mat under identical conditions. The estimated demand of fibre glass is several thousand tonnes, provided the material is available at a lower price.

In the CGCRI process, glass rods are fed at a controlled rate into an electrically heated furnace. As the tips of the rods get softened, the glass is drawn out in the form of fibres and wound in a collet drum rotating at a predetermined rate. The fibre 'cake' collected in the drum is then dried and reworked to get diamond woven mat or roving.

The laboratory has produced the material at the rate of 0.5 kg/hr. However, a pilot plant of the capacity of 1.2 kg/hr has been designed and is in operation at the laboratory.

The raw materials required in the process are commercial neutral glass rods of IS type 1 or soda glass. These materials are available indigenously. The items of equipment and accessories required are: variac transformers (40 and 15 A), temperature controller, temperature indicator, voltage stabilizer, furnace, feed system with motors and controllers, applicator and shoe

Clockwise from right: A section of CGCRI's module for the production of fibre glass; Rovings; and Cakes in the stand



'An introduction to electron microscope' published in *IETE Students Journal* [18(2) (1977), 65].

This is the third time that Dr Jain has received a prize. The earlier two prizewinning papers were: 'Fundamentals of video tape recording', and 'Microscope loudspeakers and enclosures'.

PATENTS INFORMATION

Indian Pat. 83/Del/77*

Improved processes for the production of pure 2,4-dichlorophenol

S. HUSAIN, P. ANANDA SWARUP, M.A.K. AKMAL, M. KIFAYATULLAH & R. VAIDYESWARAN

Regional Research Laboratory, Hyderabad

2,4-Dichlorophenol (2,4-DCP) is an important intermediate in the manufacture of pharmaceuticals, fungicides, herbicides, dyes, etc. It is also used in the preparation of compounds which have wide application as mothproofing agents, antiseptic and seed disinfectant. The most important use of 2,4-DCP is in the manufacture of 2,4-dichlorophenoxy acetic acid (2,4-D), a plant hormone possessing herbicidal properties.

Two processes have been developed at the Regional Research Laboratory (RRL), Hyderabad, to obtain a product with a purity of up to a maximum of 98%. The samples available commercially at present have a purity of 85-88%. In one process, phenol is chlorinated in presence of solvents under controlled conditions and the process of chlorination is followed by TLC or GLC. Formation of mono- and tri-isomers is avoided. No rigorous fractionation is needed to separate 2,4-DCP after the reaction. The solvent used in the first process can be recycled for further chlorination. In the second process, when a product of 98% purity is required as an intermediate, the chlorination is done in two steps. In the first step the reaction is restricted to the formation of *p*-chlorophenol and *o*-chlorophenol. The *p*-chlorophenol thus formed is

*Accepted

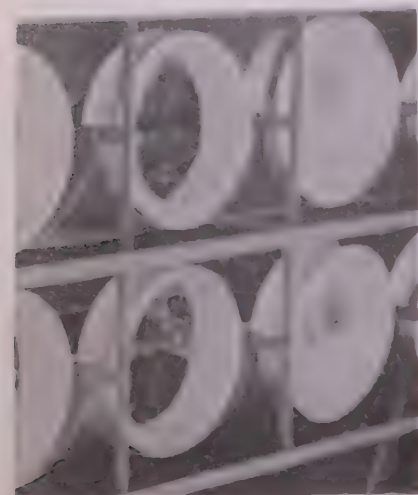
PERSONNEL NEWS

Appointments/Promotions

The following have been promoted, on assessment, at the National Geophysical Research Institute (NGRI), Hyderabad: Shri V. Babu Rao (Scientist C; 15 April 1978), Shri H.C. Tewari (Scientist C; 27 April 1978), Dr M.V.M.S. Rao (Scientist B; 13 May 1976), and Shri R. Acharya (Photographic Officer; 12 May 1975). Shri Y. Purnachandra Rao has been appointed Scientist B at NGRI (19 Jan. 1979).

Honours & Awards

Dr J.D. Jain of the Central Electronics Engineering Research Institute, Pilani, has received a prize for his paper entitled



complete with motor, traverse with motor and control, collet drum with motor, compressor, steel structure, mat unit, roving machine, accessories, and spares.

The suggested capacity* of an economically viable unit is 100 kg of fibre glass per day. Capital investment on plant and equipment for such a plant will be Rs 1.2 lakh and working capital, Rs 1.2 lakh (90 days' production cost). Consumption of electricity will be 400 kWh per day. The cost of production has been worked out at Rs 20 per kg giving a profitability of Rs 5 per kg.

Further particulars can be had from the Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

separated by distillation and is subjected to further chlorination to get 2,4-DCP with more than 98% purity. Both these processes can be adopted for batch or continuous chlorination.

Indian Pat. 62/Del/77*

Improvements in or relating to a process for beneficiation of magnesite minerals

D.K. SENGUPTA, S.R.S. SASTRI & K.S. NARASIMHAN
Regional Research Laboratory, Bhubaneswar

Magnesite is an important basic refractory raw material. A substantial portion of the 50 million tonnes of raw magnesite reserves found in India contains 2-7% silica and hence is unsuitable for refractory application. Attempts made at the Regional Research Laboratory (RRL), Bhubaneswar, to beneficiate such high-silica raw magnesite have resulted in the development of a technically feasible process involving flotation. In the process, a product containing silica of less than 2% could be obtained in conformity with IS:1749-1961 with more than 60% magnesite recovery. Silica content can be brought down to around 1% at the cost of recovery. The novelty of the process is the stage addition of fatty acid collector to a slurry conditioned in the presence of metallic ions. The process is particularly applicable to raw ores containing silica present in the form of quartz.

The process consists in the crushing and grinding of the raw magnesite ore to liberate magnesite grains from silica and other gangue materials and conditioning a slurry containing 10-30% of ground ore for 5-40 min. with the addition of depressants like sodium silicate and dextrin followed by the addition of salts of multivalent metals like ferric chloride, cupric nitrate or calcium chloride or by the addition of mineral acids like hydrochloric, sulphuric or nitric acid in sufficient quantity so as to give the same ionic strength as would have been achieved by the addition of the aforesaid electrolytes by reaction with the constituents present

in the mineral. The slurry is further conditioned with established collectors like oleic acid, synthetic aliphatic alcohols or naphthanic acid for a period of 10-40 min. The flotation operations are then carried out as per the conventional procedure.

Indian Pat. 556/Cal/76*

Improvements in or relating to the electrochemical preparation of *p*-aminobenzoic acid sulphate/*p*-aminobenzoic acid from *p*-nitrobenzoic acid

H.V.K. UDUPA, M.S. VENKATACHALAPATHY, S. CHIDAMBARAN & M.R.K. SRINIVASAN
Central Electrochemical Research Institute, Karaikudi

The invention covered by this patent relates to the improvements made in the electrochemical preparation of *p*-aminobenzoic acid (PABA) from *p*-nitrobenzoic acid (PNBA). PABA is mainly used as an intermediate in the preparation of local anaesthetics like benzocaine and procaine and for the preparation of folic acid. The chemical methods employed involve the use of reducing agents or costly catalysts and separation of the product is tedious and laborious. The present invention eliminates these drawbacks by an electrochemical reduction technique. It consists in the electrolytic reduction of PNBA in an electrolytic cell fitted with either a stationary or rotating copper cathode using dilute sulphuric acid as electrolyte with titanous salt as catalyst. A ceramic porous pot is employed to separate the catholyte from the anolyte, and lead anodes are used. A current density of 5-20 A/dm² can be employed. A current efficiency of 80% and an isolated yield of 85% have been obtained with an energy consumption of 5 kWh/kg of PABA.

The process gives a purer product and since the product is separated as amine sulphate, isolation of the product is simplified. Another advantage of the process is that the electrolyte can be reused a number of times.

Indian Pat. 50/Del/76*

An electrochemical process for production of *p*-toluidine from *p*-nitrotoluene

H.V.K. UDUPA, M.S. VENKATACHALAPATHY & S. CHIDAMBARAN
Central Electrochemical Research Institute, Karaikudi

This invention relates to the electrochemical process for the production of *p*-toluidine (PAT) from *p*-nitrotoluene (PNT). PAT is used as an intermediate in dyestuff industries. Hitherto, it has been produced chemically by employing zinc or iron powder and hydrochloric acid for reduction. It is tedious and laborious to separate the product while using chemical reducing agents. The earlier electrochemical methods reported give low yield and amino cresols are obtained as byproducts. The present process eliminates these drawbacks by adopting an improved electrochemical reduction technique. It consists in the electrolytic reduction of PNT in an electrolytic cell fitted with either stationary or rotating copper cathodes. The catholyte is separated from the anolyte by means of a ceramic diaphragm. The electrolyte employed is dilute sulphuric acid with a titanous salt as catalyst. The amine sulphate is separated from the cell from which separation of PAT is easier. A current density of 5-20 A/dm² can be employed. A current efficiency of 75% and a yield of 85% can be obtained.

The present process gives a very pure product. The other advantages of the process are: a higher yield of PAT is obtained, amino cresols are not formed, and the electrolyte can be reused.

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71/Del/76 (143253): Dezincing of steel scrap by leaching with inhibitor impregnated acid, P.B. Mathur & M. Venkatakrishna—CECRI, Karaikudi.

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passivate aluminium, N. Subramanyan, S.V. Ayyar & V.S. Kapali—CECRI, Karaikudi.

1532/Cal/74 (142142): Composition for the inhibition of corrosion of steel in cooling water systems, N. Subramanyan, K. Balakrishnan, B. Sathianandham & M. Krishnan—CECRI, Karaikudi.

417/Cal/75 (142789): A process for the preparation of rigid polyurethane foams from cashewnut shell liquid, N.D.R. Ghatge & K.B. Gujar—NCL, Pune.

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384/Del/78: A process for the synthesis of 3-(2-benzofuranyl)-3-alkyl-2,2-dimethylpropionic acids as anti-fertility agents, K.V.B. Rao, J.D. Dhar, B.S. Setty & R.N. Iyer—CDRI, Lucknow.

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ores and concentrates, S.B. Rao, S.K. Mandal & B.R. Sant—RRL, Bhubaneswar.

909/Del/78: Improvements in or relating to water displacing rust preventive oil for temporary corrosion protection, K.S. Rajagopalan, S. Guruvaiah, M. Sundaram & C. Rajagopal—CECRI, Karaikudi.

926/Del/78: Improvements in or relating to anticorrosion packaging papers, K.S. Rajagopalan, N. Subramanian, R. Srinivasan, R. Radhakrishnan, N. Kirthivasan, M. Sundaram & M.E. K. Janaki—CECRI, Karaikudi.

930/Del/78: Improved photoconductive plates for use in electrophotographic machines and a process of preparation of the same, P.C. Mehendru, K.K. Jain, V.S. Panwar—NPL, New Delhi.

950/Del/78: A continuous process for the surface graining of aluminium foil for aluminium offset lithographic plates used in duplicating machines, B.A. Shenoi, R. Subramanian, V. Laxminarasimhan, R. Venkatachalam & D. Kanakaraj—CECRI, Karaikudi.

958/Del/78: A new process for the preparation of *cis*-caronic acid from 4-L-acetyl car-2-ene, R.B. Mitra, G.H. Kulkarni, K.G. Gore, P.N. Khanna, G.D. Joshi & A.S. Khanra—NCL, Pune.

959/Del/78: Process for preparation of D-galactose from Bael-gum (*Aegle marmelos*), (Miss) N. Banerji & A.K. Das—IIEM, Calcutta.

962/Del/78: Improvements in or relating to electroless plating of nickel, B.A. Shenoi, S. John & N.V. Shanmugam—CECRI, Karaikudi.

Diosgenin and Other Steroid Drug Precursors

The Publications & Information Directorate, New Delhi, has brought out a monograph with the above title.

Prepared by Miss L.V. Asolkar and Shri Y.R. Chadha of this Directorate with the assistance of various experts in the field, the monograph gives a

comprehensive and up-to-date account of the steroid drug precursors, with special reference to India and with emphasis on diosgenin.

The monograph is divided into six chapters: Introduction—developments in the steroid field and present trends; Sources of Diosgenin—dioscoreas and other genera with their descriptions and distribution, and their cultivation, economics, improvements, and tissue culture techniques; Extraction and Assay Procedures of Diosgenin—extraction methods with techno-economic data, identification techniques, and detailed assay procedures with their merits and demerits; Diosgenin Conversion to Steroid Drugs and Uses—16-DPA and product pattern with intermediates and yields, conversion to steroid drugs with molecular flow-sheets of some steroid processes, microbiological transformations, and uses; Steroid Drug Precursors Other than Diosgenin—solasodine, hecogenin, sterols, bile acids, etc. with a molecular flow-sheet and a summary flow-sheet of industrial processes, microbiological conversions, future prospects; and Production, Requirements and Trade—estimated production and demand of the precursors in India and the world, trends, competition from total synthesis as also from prostaglandins.

Profusely illustrated, the monograph includes useful references at the end of each chapter. Based on a comprehensive survey of the published literature, it also draws extensively on personal communications and discussions with various experts.

The monograph would be an asset to steroid chemists, research workers, and steroid manufacturing firms, as also to those interested in the cultivation of *Dioscorea* and other vegetable sources of diosgenin.

The publication (Pp. 170, royal 8vo) is priced at Rs 32 (\$ 12, £ 5.50), and can be had from the Sales & Distribution Officer, Publications & Information Directorate (CSIR), Hillside Road, New Delhi 110012.

Indo-US Workshop on Biodegradable Pesticides: ITRC

The extensive use of chlorinated pesticides like DDT and BHC has caused worldwide concern. These pesticides build up residues in the food chain and animal/human tissues. However, they are very potent in controlling pests in low doses. Although the developing countries have discontinued the use of these chemicals, India continues to utilize them to combat vector-borne diseases like malaria and encephalitis. With the objective of providing the leading American and Indian scientists an opportunity to exchange views on various aspects of pest control, an Indo-US workshop on Biodegradable Pesticides, co-sponsored by the Department of Science &

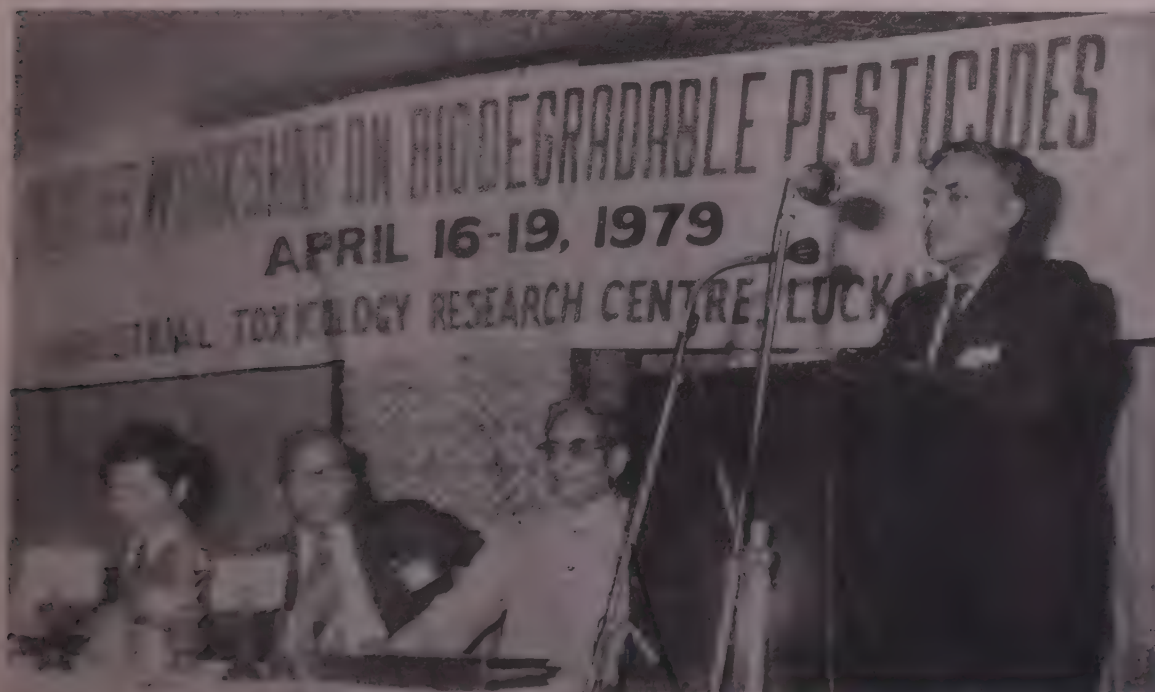
Technology, India, and the National Science Foundation, USA, was held at the Industrial Toxicology Research Centre (ITRC), Lucknow, from 16 to 19 April 1979. The workshop was attended by American and Indian teams each consisting of nine scientists supported by 50 invited observers/participants. Dr Fumio Matsumura, Professor and Director, Pesticide Research Centre, Michigan State University, USA, led the US delegation and Dr C.R. Krishna Murti, Director, Industrial Toxicology Research Centre, Lucknow, led the Indian delegation.

Inaugurating the workshop, Dr S. Varadarajan, Chairman and Managing Director, Indian Petrochemicals

Corporation Ltd, Baroda, mentioned that it was possible to achieve the targets set for food production because of the application of modern agrotechniques including pest management chemicals. Dr Varadarajan called for greater attention to the study of the biochemistry of insects so that the knowledge gained could be used eventually for the biological control of pests. The inaugural function was presided over by Dr R.V. Singh, Vice Chancellor, Lucknow University, Lucknow.

The deliberations of the workshop were held in three technical sessions. At the first session were presented reports by the leaders of the two delegations on the state of art in R&D in pesticides in the two countries. Then followed an exchange of views on the problems in the biodegradation of pesticides that had eluded understanding. Collaborative research in certain areas was suggested at this session.

The second and third session dealt with status papers on the mechanisms of biodegradation; biodegradation in soil, plants, animals and microorganisms; application of biodegradable pesticides in agriculture, forestry and food preservation; development of new biodegradable pesticides and their



Dr S. Varadarajan, Managing Director and Chairman, Indian Petrochemicals Corporation Ltd, Baroda, inaugurating the Indo-US workshop on Biodegradable Pesticides; seated on the dais are (from left): Dr Fumio Matsumura, leader of the US delegation; Dr C.R. Krishna Murti, leader of the Indian delegation; and Dr N.L. Ramanathan, Director, Department of Science & Technology

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bioefficacy; and safety evaluation and health impact of pesticide spraying programmes in eradicating vector-borne diseases.

The workshop adopted the following recommendations for consideration by the Indian and the US governments:

Recognizing that continued use in the foreseeable future of chemicals for the control of pests in public health, agriculture and forest was indispensable, the workshop suggested that a greater impetus should be given to the study of the mechanism of biodegradation and photochemical degradation of pesticide compounds in the environments.

In view of the strategic need for pest control chemicals, concerted efforts should be initiated to monitor their impact on the environment and human health.

Simultaneously, R&D for synthesizing chemicals possessing the requisite bioefficacy and specificity that are environmentally acceptable should be supported.

The workshop emphasized the urgent need for undertaking basic research on the biology of pests as well as on other innovative methods of pest management on a priority basis to achieve the objective of the preceding recommendation.

The governments of India and USA should set up mechanisms for funding and encouraging such collaborative research under the Indo-US Subcommission on Science and Technology.

The rapport established between the Indian scientists and US scientists in this area should be continued and strengthened through exchange of scientists, training of personnel and offer of fellowships and exchange of information.

A follow-up session should be held to evaluate the progress made in this field and a joint workshop which could discuss additional topics of interest not specifically discussed in the present workshop may be convened after a suitable interval.

The workshop identified priority areas for collaborative research and generated 19 specific research proposals. □

CECRI-Paint Industry Get-together

The Central Electrochemical Research Institute (CECRI), Karaikudi, organized a get-together of CECRI scientists and representatives from paint industries at the CSIR Complex, Madras, on 5 March 1979. Twenty representatives from the paint industry participated in the get-together. Dr H.V.K. Udupa, Director of the laboratory, inaugurated the get-together. The achievements of the laboratory in the area of paints and pretreatment chemicals during the last two decades were reviewed by Dr K.S. Rajagopalan, Deputy Director. Non-

technical notes on eleven products and processes relating to corrosion prevention were presented at the get-together.

The on-going research programmes at CECRI on zinc-rich paints, rust-converting primer, cathodic protection of painted metals, preparation of calcium chromate iron oxide primer, and correlation of corrosion protection with physico-chemical properties of varnish and resin films were briefly surveyed by the CECRI scientist. The representatives from the paint industry, who were apprised of the future programmes of CECRI in this field, evinced interest in the laboratory's work.

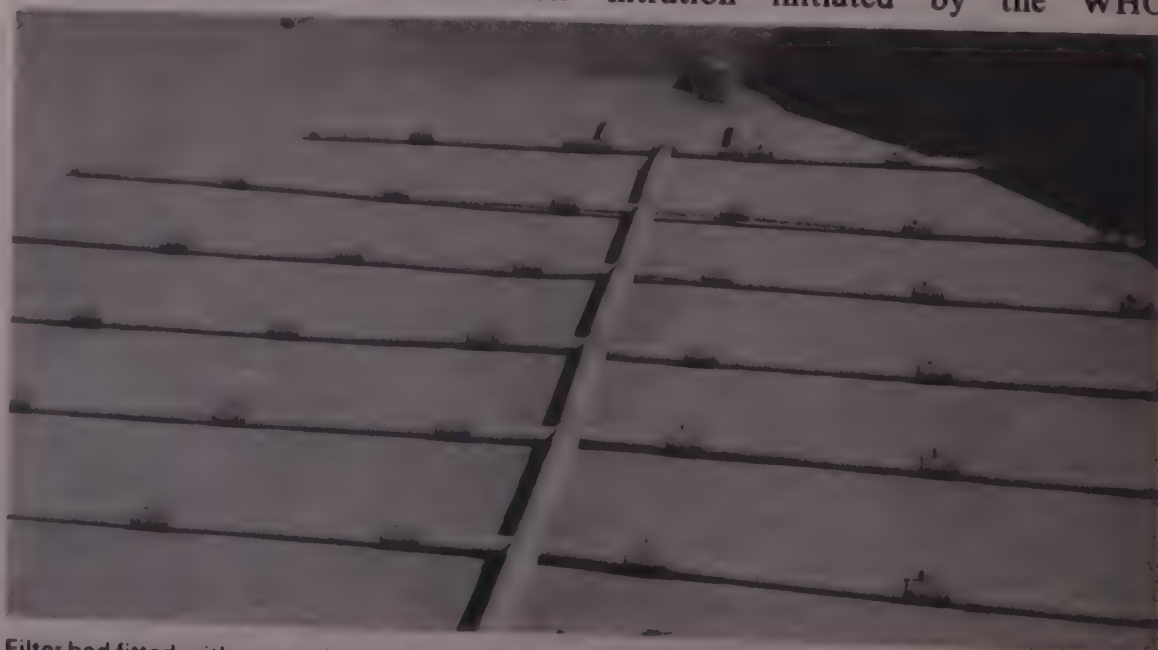
Later, Dr Udupa, summarizing the proceedings of the day, assured the gathering that further work would be carried out in the laboratory in the light of the observations made by the participants. □

Slow Sand Filtration Plants for Treating Water in Rural Areas

NEERI's EFFORTS

The National Environmental Engineering Research Institute (NEERI), Nagpur, has been assisting the states of Andhra Pradesh, Haryana, Maharashtra and Tamil Nadu in setting up water treatment demonstration

plants, which employ the slow sand filter technique, in rural areas. The construction of these plants is a part of the international research-cum-demonstration project on slow sand filtration initiated by the WHO



Filter bed fitted with permeable capsules of slow sand filtration plant at Kamayagoundanpatti village (near Madurai)



Mr Paul Kerkhoven, Programme Officer, WHO IRC (*second from left*); Mr Dirkzwager, First Secretary, Royal Netherlands Embassy (*third from left*); and Dr B.B. Sundaresan, NEERI's director (*fourth from left*) discussing the role of permeable capsules being utilized for slow sand filtration demonstration plant at Kamayagoundanpatti village

International Reference Centre (WHO IRC) for Community Water Supply, The Hague, Netherlands, under its worldwide promotional activities in the field of water supply. NEERI is one of the collaborating centres of WHO IRC and is participating in this programme.

The aim of this project is to demonstrate the suitability of the slow sand filtration process under different local conditions and to promote its large-scale application in India, especially in rural areas, for the treatment of surface waters. The advantages of slow sand filters are simplicity in operation and maintenance, reliable quality of the filtered water, and doing away of skilled supervision.

In India, the programme was launched by NEERI in 1976. Under the programme, NEERI designed and planned to set up four village demonstration plants, one each in Andhra Pradesh, Haryana, Maharashtra and Tamil Nadu.

The first demonstration plant was commissioned at Abubshehar in Sirsa district, Haryana, in November 1978. Meant for 13,000 people the plant cost Rs 16.68 lakh.

The second plant was commissioned

at Kamayagoundanpatti village (near Madurai) on 15 March 1979. The plant was built with the technical collaboration of NEERI and constructed at a cost of Rs 4.11 lakh by the Tamil Nadu Water Supply and Drainage Board. The plant augmented the drinking water supply to the village by 100,000 gal./day.

The third plant is under construction at Borujwada village, near Nagpur. This plant has been designed for a population of 1300 at an estimated cost of Rs 2.70 lakh. The source of water is Kolar River. Under NEERI's Rural Sanitation Programme the entire population of Borujwada has been provided with rural latrines and wells have been chlorinated.

The fourth plant is expected to be commissioned by the end of June this year in Pothunuru village (West Godavari district, Andhra Pradesh). Estimated to cost Rs 3.68 lakh the plant is expected to meet the requirements of more than 6200 people.

Shri R. Paramasivam, head of NEERI's Engineering Division, is the project coordinator for the Slow Sand Filtration Project in India on behalf of WHO IRC.

Norwegian Assistance to NIO

Under an agreement signed between the Government of India and the Norwegian Government on 15 December 1978, Norway will assist the National Institute of Oceanography (NIO), Goa, in its surveys for marine mineral and seabed. The request for assistance was made by NIO about two years ago and a Norwegian team carried out feasibility studies last year. A major part of the assistance under the agreement will be used to procure sophisticated equipment for the research vessel *Gaveshani* for carrying out marine geological and geophysical surveys. Under the project, a number of NIO scientists will be sent to Norway for training. Norway has agreed to provide assistance to the extent of six million Norwegian kroner towards equipment and the training of scientists. □

Course on Computer Programming at NIO

A course on Computer Programming was conducted during February-March 1979 at the National Institute of Oceanography (NIO), Goa. Organized by the Planning and Data Division of the laboratory with the help of experts from the Electronics Corporation of India Ltd, Hyderabad, the course included computer programming of the various jobs with a view to making full use of the computer at NIO. It included programming in FORTRAN IV and was supported by about 20 exercises and extensive demonstration of various peripherals used in the computer. Nearly 40 persons attended the course. NIO has plans to conduct in the near future another course on programming in COBOL. □

Industry Takes up Three CECRI Processes

Three processes developed by the Central Electrochemical Research Institute (CECRI), Karaikudi, viz. those for the production of zinc from

galvanizer's ash, ammonium perchlorate, and dry cells, have been taken up by industry for commercial exploitation. The process for the production of potassium bromate has been demonstrated to a party.

Zinc from Galvanizer's Ash

Lakshmi Zinc Industries, Mettur Dam, has put up a plant for the manufacture of zinc from byproduct oxide or galvanizer's ash based on the technology developed by CECRI. The plant, comprising 1000A cells and having an initial capacity of 0.5 tonne per day, started functioning in January 1979. In this process for production of zinc from byproduct oxide, finely ground oxide is kept in suspension in very dilute sulphuric acid, and the compact, adherent sheet deposit of zinc formed on aluminium cathode is removed from cathode periodically and re-melted to get zinc ingots of 99.95% purity.

Ammonium Perchlorate

The Indian Space Research Organisation (ISRO) has put up near Alwaye a 150-tonne plant for the production of ammonium perchlorate at a cost of Rs 84 lakh. Built with CECRI know-how, the plant was inaugurated by Shri P.K. Vasudevan Nair, Chief Minister of Kerala, on 5 February 1979.

The manufacture of ammonium perchlorate consists of a sequence of operations such as electrolysis, double decomposition, centrifugal crystal separation, recrystallization, and drying. Sodium chloride is oxidized to sodium perchlorate by electrolysis, and the latter is doubly decomposed with ammonium chloride to produce ammonium perchlorate. Sixteen electrolytic cells of the capacity of 4000 A each arranged in two rows are in operation. Lead dioxide coated graphite anodes are also manufactured in the plant for captive use.

Ammonium perchlorate produced in the plant will be used mainly in ISRO's rocket programmes at the Vikram

Sarabhai Space Centre, Trivandrum, and SHAR Centre at Sriharikota.

Dry Cells

A dry cell (Leclanche type) manufacturing unit of the Southind Flash Pvt. Ltd, Aroor, Kerala, was inaugurated by Shri N.C. Johnson, Deputy Director, District Industries Centre, Alleppey, on 3 January 1979. Established on the basis of CECRI know-how licensed through the National Research Development Corporation of India, the plant envisages a production of 4000 cells per day (single shift). The product will be marketed under the trade name Super.

The know-how is labour-intensive and utilizes indigenous manganese ore as depolarizer. The cells conform to IS specifications.

Potassium Bromate

CECRI process for the production of potassium bromate employing graphite substrate lead dioxide anodes was demonstrated on 500 A scale to the representatives of the licensee Ranganayaki Chemicals (P) Ltd, Madras, during 22-26 February 1979. □

Mobile Vibration and Noise Laboratory: NAL

The Systems Engineering Division of the National Aeronautical Laboratory (NAL), Bangalore, has set up a mobile vibration and noise laboratory, which is intended to provide a source of sophisticated analytical tools to industrial users in the field environment.

Vibration and noise are undesirable byproducts of modern engineering activities. Vibrations lead to wear and tear and consequent failures and fatigue in machines and structures. Noise causes annoyance and, in sustained doses, poses danger to health. An increase in the level of vibration and noise or a change in their pattern (signature) often indicates the onset of fault conditions in machinery.

Modern techniques of measurement

and signature analysis help diagnose faults in machines and structures and enable preventive maintenance and redesign to avoid malfunctions which lead to catastrophic failures. Application of these techniques requires a variety of sophisticated devices and equipment. To be of optimum utility such devices must be available to the engineer at the site.

NAL's mobile laboratory carries a complement of instruments and a battery-driven powerpack which makes it independent of any external power supply. Multipoint measurement and recording, with time and frequency domain analysis, may be carried out in the field for condition monitoring and fault diagnosis. Back-up of NAL expertise on systems, aero and structural dynamics and materials is also available for analysis of results.

The mobile laboratory is capable of carrying out the following vibration and noise measurements:

Measurements

Acceleration	: 0.0001 g to 1000 g
(multiaxial)	
Frequency range	: 0.1 Hz to 10 kHz
Mechanical	
shock	: up to 10,000 g
Acoustic noise	: up to 140 dB
Frequency range	: 10 Hz to 20 kHz
Sonic boom	: up to 150 dB
Frequency range	: 0.01 Hz to 15 kHz

Analysis

Analog spectrum	: 1% to 1 octave bandwidth in the range 0.2 Hz-20 kHz
Digital spectra	
(constant bandwidth)	: auto and cross correlation

Real-time spectrum analysis and statistical distribution analysis will be taken up in future.

The applications of the mobile laboratory include: (1) measurement of vibration levels and spectra for condition monitoring, preventive maintenance, detection of incipient failure, fault diagnosis, vibration isolation, quality control, etc.; (2) measurement and analysis of acoustic noise in industrial and vehicular traffic environments for evaluation of noise criteria, environmental planning, transportation

engineering, etc.; and (3) vibration and noise measurements in automobiles, aircraft and equipment on mobile platforms, in stationary and towed modes of operation.

Prospective users can avail themselves of the services of the mobile laboratory for vibration and noise problems, and may obtain further details from: The Director, National Aeronautical Laboratory, Post Bag No. 1779, Bangalore 560017. □

PROGRESS REPORTS

CDRI Annual Report: 1977

The annual report of the Central Drug Research Institute (CDRI), Lucknow, for 1977, published recently, presents the R&D activities of the laboratory in 14 major areas. Of these, 11 areas were devoted to the development of new chemotherapeutic, chemoprophylactic, immunotherapeutic and immunoprophylactic agents for various disease conditions and development of contraceptives and devices for control of fertility. Malaria was added as a new area. One area was concerned with the utilization of plant resources and two other areas were related to the development of technology for production of synthetic drugs, fermentation chemicals and biological products. In many areas there has been collaborative work with universities and other research centres.

Under the programme of new drug development, a number of active compounds have entered the final stages of evaluation. A local anaesthetic, Centbucridine, underwent multicentric clinical trials for infiltration and nerve block anaesthesia in more than 900 cases and was found safe and effective; its clinical trial entered phase III. The tranquilisedative, Centazolone, completed clinical trial phase II and permission for undertaking phase III study was received from the Drugs Controller (India). A neuroleptic, Centbutindole, after successful completion of clinical trial phase I, was

under phase II evaluation. Its leptanalgesic activity was found to be better than that of Droperidol, and tolerance to it did not seem to develop. Clinical trials (phase I) were completed with an antidepressant and antihypertensive. The diuretic activity of the new antihypertensive was found to be similar to that of the drug Clonidine, but while the former caused sodium excretion the latter caused sodium retention.

An anticestode compound (75/98) was found to be about eight times as active as Yomesan, the commonly used drug for taeniasis, in experimental *Hymenolepis nana* infection in rats. Its subacute toxicity study has been completed.

Guggulipid, a hypolipidaemic product prepared from the oleoresin of *Commiphora mukul* (Guggul), was found to be well tolerated in phase I single-dose clinical trial.

An intravaginal contraceptive cream, Consap, showed no adverse side effects in single application tolerance study in human females. This cream contains as spermicide the total saponins of *Sapindus mukorossi* (soapnut).

A device for causing dilation of the cervix, named 'Isap-tent', was under field trial with the collaboration of the Indian Council of Medical Research and satisfactory results have been obtained in 140 cases tried so far. This device has been made from the seed husk of *Plantago ovata* (Isapgol) and could be used as a substitute for the imported and more expensive laminaria tent.

The cultivation and purification of large quantities of merozoites of the malarial parasite *Plasmodium knowlesi* from schizont-infected cells of rhesus monkey were standardized. This would facilitate basic biochemical studies on malarial infection and development of a merozoite vaccine against malaria. A new host for *P. knowlesi* was discovered in the Assam monkey, *Macaca assamensis*, in which the infection was synchronous like that of *P. berghei* in rhesus monkey and led to the death of the animal.

Laboratory methods were standardized for the anti-malarials Daraprim

and Primaquine, the antileprosy drug Lamprene and the abortifacient drug ethacridine lactate.

Drug-resistant strains of *P. berghei* were developed in weanling rats without the use of ethyl palmitate for reticulo-endothelial blockade. Administration of subcurative doses of drug with rapid passage was found to be suitable for selection of resistant strain. A pyrimethamine-resistant strain and a chloroquine-resistant strain have been obtained. The resistance is stable even when the parasite is maintained by drug-free passage for some time. It was observed that almost complete protection could be provided to rats against *P. berghei* infection by injection of an extract of the spleen of immune rats.

A simple method based on Baerman's technique was developed for collecting infective larvae of the human filarial parasite *Brugia malayi*, in good yield, from the vector mosquitoes without dissecting the latter. This method would facilitate preparation of larval antigen required for immunological studies.

An *in vitro* study showed that liver played an important role in the microfilaricidal action of the drug diethylcarbamazine in experimentally infected rats.

A model of *Nippostrongylus brasiliensis* infection in *Mastomys natalensis* was standardized. This could be used as an alternative to the rat model for routine screening of anti-hookworm compounds. The adult female of *N. brasiliensis* was found to be highly immunogenic; transplantation of even 10 female worms into the intestine of clean rats produced immunity against subsequent challenge. Male worms, given along with the females, inhibited the immunogenic potential of the latter.

Immunodiagnosis of ascariasis with purified human antigen gave positive reaction; there was no cross-reaction with cases of amoebiasis and giardiasis, but taeniasis showed cross-reaction.

In the area of amoebiasis, the discovery of a new strain (KK) of *Entamoeba histolytica* which can produce both intestinal and hepatic

amoebiasis in hamsters provided another model for the testing of anti-amoebic compounds. The ability of axenically grown *E. histolytica* strain NIH-200 to invade host tissue in rats and hamsters and to produce the disease was established to be dependent on association of the amoeba with live bacteria like *Escherichia coli*, *Clostridium welchii* and mixed flora. It was possible to produce amoebic dysentery in hamsters by intrarectal inoculation of *E. histolytica* cysts isolated from human faeces. The presence of active trophozoites in the caecum would indicate that the cysts excyst in the large intestine. This finding suggests the possibility of auto-infection as an important factor in amoebiasis.

Inclusion of P and/or V plasmids in *Vibrio cholerae* cells resulted in suppression of the virulence of the bacteria due to decreased or no release of toxin. The P⁺V⁺ strains seemed to be fairly stable suggesting that inclusion of one or both of the plasmids in *V. cholerae* cells would enhance the safety of a live vaccine.

An interferon-inducing antibiotic obtained earlier from a strain of the fungus *Aspergillus ochraceus* was found to be a potent inhibitor of Semliki forest virus and Kysanur forest virus infections in mice. The activity is mainly due to its nucleic acid component which is a double-stranded RNA. A method for isolation of the latter from the fungus mycelium was standardized.

Studies on the central nervous system showed that adrenergic transmission played an important role in pyrexia induced in rabbits by centrally acting agents.

In studies on diabetes, a high level of the plasma activator apolipoprotein-glutamic acid peptide was demonstrated in insulin-deficient alloxan-diabetic rats. It is responsible for the activation of lipoprotein lipase though the activity of the enzyme itself is decreased.

A rat model was standardized for the testing of vas occluding agents. Insertion of a copper intrauterine contraceptive device unilaterally in rats produced an

increase in the levels of estrogen and progesterone in both the ovaries, which would indicate that the device has a systemic effect. Examination of the zinc content of the vas deferens and different parts of the epididymis of intact, uni- or bilaterally castrated rats showed that it was maximum in the vas deferens. But castration decreased the total zinc content in vas deferens and epididymis on the operated side, which could be due to the absence of spermatozoa in these tissues. It was established that the structural and functional integrity of the epididymis of rabbit and rhesus monkey, as in the case of rat, is dependent on androgen. Vasectomy had no effect on the normal functioning of the genital organs of the adult male rat.

A three-step process starting from the indigenously available *p*-anisidine was developed earlier for Indomethacin, an imported anti-inflammatory drug. The process on a 1-kg scale has been handed over to the sponsors, Indian Drugs and Pharmaceuticals Ltd, and Kembiotic Collaborators, Bombay. One of the intermediates is levulinic acid, which is not produced in the country, and a process for its production from sugar was standardized on a 3-kg scale. A process for calcium levulinate, which is an alternative to calcium gluconate, was also standardized using levulinic acid as the starting material.

Development of a process for the production of Clonidine, an imported anti-hypertensive drug, starting from 2,6-dichloroaniline, was completed and the process demonstrated to the sponsor, Sarabhai Research Centre, Baroda.

A laboratory scale process for the preparation of pepsin, a digestive enzyme from the mucosal lining of the stomach of goats and sheep, which is a slaughter-house waste product, was demonstrated to Research and Development of Industrial Biochemicals and Natural Products Ltd, Varanasi.

One hundred and fifty-five papers were published (110 in Indian and 45 in foreign journals), and five patents were filed. □

CSIR's EXTRAMURAL RESEARCH

Molecular Thermodynamics and Viscous Flow Properties of Liquids, Liquid Mixtures and Polymer Solution

Under a CSIR scheme granted to Dr B.K. Sharma of the Department of Science (Physics), Regional College of Education, Bhubaneswar, it is proposed to develop a molecular thermodynamic theory of viscous flow properties of liquids, capable of explaining experimentally observed facts relevant to viscous flow. An attempt will be made to obtain a reduced equation of state for liquids on the basis of a suitable configurational partition function of the liquid state and the fluctuations of intermolecular energy by considering that both vibrational and translational degrees of freedom coexist in the liquid state. Theoretical methods will be proposed to estimate various molecular and thermodynamic properties such as thermal expansion and pressure coefficients, compressibility, disorder parameter, lattice distortion parameter, number of holes, cohesive energy density, pseudo-Grüneisen parameter, Debye temperature, energy of viscous flow and energy of vaporization, in terms of characteristic parameters necessary for the description of liquid state. A reduced equation for viscous flow will be obtained which will be capable of elucidating quantitatively the viscous flow properties of liquids, and the dependence of reduced viscosity on reduced volume, temperature, pressure and other molecular thermodynamic properties. It will be of interest to obtain relationships amongst various molecular thermodynamic parameters and to find the magnitude of their effect on viscous flow properties. The treatment will be extended to liquid mixtures and polymer solutions. A comparison of theoretically calculated and experimental values of molecular thermodynamic parameters will be made. Attempts will

be made to indicate validity and utility of the proposed investigations in the whole liquid range, giving fillip to newly developing field of liquid state physics, interdisciplinary areas, polymer melts, dense liquids and gases, both under flow and high pressures, in which there is no satisfactory theoretical treatment so far.

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Isatoic Anhydride

Isatoic anhydride is a versatile organic intermediate. It is used in the manufacture of several industrially important chemicals related to anthranilic acid, viz. methyl anthranilate, ethyl anthranilate, *n*-methyl methyl anthranilate, methaqualone, 4-ketobenzotriazine, 5-sulphoanthranilic acid and indigo. It is also used as a blowing agent for ABS polymers. Isatoic anhydride is a relatively new organic intermediate and is not known to be produced in the country. However, as it can replace anthranilic acid in its industrial applications, it appears to have good sale potential.

The Regional Research Laboratory (RRL), Bhubaneswar, has developed a process for the manufacture of isatoic anhydride from phthalimide. The process consists in the oxidation of phthalimide by chlorine or sodium hypochlorite under suitable reaction conditions. The acidification of reaction mixture precipitates isatoic anhydride, which is centrifuged, washed with water and dried. The RRL-Bhubaneswar process has been standardized on a scale of 4 kg of product per batch. A quantity of 30 kg has been prepared in the bench scale experiments.

The product has been tested in the laboratory and found to conform to the following specifications: appearance, light tan to grey; assay (min.), 96%; moisture (max.), 10%; and ash (max.), 0.5%.

The main raw materials required in the RRL process are: phthalimide, sodium hydroxide, chlorine and hydrochloric acid.

Theoretical investigations on liquid viscosity will provide ground work for computing other liquid state transport and surface properties through direct correlations.

Shri Nigamananda Das (a CSIR research fellow) is also associated with the scheme. □

All the raw materials are available indigenously. Reaction vessels (SS), centrifuge, tray drier, stirring vessel, ice-making machine and weighing machine are the equipment needed.

The capacity of the suggested economically viable unit is 10 tonnes of the product per annum (single shift). The total investment required for such a unit is estimated at Rs 2.70 lakh [fixed capital on building, Rs 0.4 lakh; fixed capital on plant, Rs 1.5 lakh; and working capital (90 days' manufacturing cost), Rs 0.8 lakh]. The cost of production works out to be Rs 31,700/tonne.

Further particulars can be had from the Managing Director, National Research Development Corporation of India, 61 Ring Road, New Delhi 110024. □

PATENTS INFORMATION

Indian Pat. 812/Cal/75*

Electrochemical preparation of β -alanine hydrochloride from cyanoacetic acid

V. KRISHNAN, K. RAGHUPATHY & H.V.K. UDUPA
Central Electrochemical Research Institute, Karaikudi

The Central Electrochemical Research Institute (CECRI), Karaikudi, has developed a process for the electrochemical preparation of β -alanine hydrochloride from cyanoacetic acid. β -Alanine, an amino acid, is used in the synthesis of the vitamin pantothenic acid. The demand for β -alanine is about 30 tonnes/annum, and the amino acid is imported at present.

In the CECRI process, deposited

*Accepted

palladium black cathode is used for reducing cyanoacetic acid in a supporting electrolyte of aqueous hydrochloric acid medium. As cyanoacetic acid is highly soluble, a high concentration of the depolarizer can be employed. The reduction is carried out at a lower current density at laboratory temperature. The catholyte on vacuum distillation gives a syrupy mass, which is purified by maceration with methanol-ether mixture. The β -alanine hydrochloride thus obtained is very pure. The process details have been worked out to scale up the process to higher amperage cells. □

PERSONNEL NEWS

Honours & Awards

Dr V. Jagannathan

Dr V. Jagannathan of the National Chemical Laboratory (NCL), Pune, has been awarded the VASVIK award for the year 1978. The award comprises a gold medal and a cash prize of Rs 25,000. Instituted by the Vividhlaxi Audyogik Samshodhan Vikas Kendra (VASVIK), Bombay, these awards, seven in all, are given annually for outstanding industrial research in the fields of electronics, electrical, materials, mechanical, chemical, biological and agricultural sciences and technology. Dr Jagannathan's award is for contributions to the field of biological sciences and technology. Dr Jagannathan has made valuable contributions in biochemistry, particularly in enzyme chemistry and plant tissue culture.

The Prime Minister Shri Morarji Desai gave away the awards at a function held in Bombay on 1 April 1979. Shri Ramkrishna Bajaj, President, Indian Merchants' Chamber, presided over the function.

A Ph.D. of the Stanford University (USA), Dr Jagannathan joined NCL in 1951 as Senior Scientific Officer. At present he holds the position of Scientist F, and heads the Biochemistry Division.

Dr Jagannathan is a recognized guide for Ph.D. of the Poona, Bombay and Baroda universities. Sixteen research

workers have obtained Ph.D. and M.Sc. degrees under his guidance. He was the editor of *Biochemica et Biophysica Acta* (1963-77) and is on the editorial board of *Indian Journal of Biochemistry and Biophysics* since 1964. He is fellow of Indian National Science Academy, and of Indian Academy of Sciences. □

Prof. V.A. Altekar

Prof. V.A. Altekar, Director, National Metallurgical Laboratory, Jamshedpur, has been awarded the Distinguished Achievement Medal of the Colorado School of Mines, USA, for 1979 in recognition of his contributions in the general field of mineral engineering. He is the first Indian to receive this honour.



Prof. Altekar has made valuable contributions in the different disciplines of metallurgy—especially in the mineral beneficiation and extraction metallurgy. Dr Altekar's process relating to lead extraction from sulphide ores has attracted attention in Turkey and USSR.

Prof. Altekar has to his credit more than 200 research and technical papers and a dozen patents. □

Research Programmes in Environmental Engineering and Science in India

The National Environmental Engineering Research Institute (NEERI), Nagpur, has brought out the above title which contains information on 462 current research projects grouped under eleven sections: water, waste water, solid wastes, air pollution, noise pollution, pollution by pesticides, pollution by radioactive substances, industrial hygiene, rural sanitation, environmental sanitation in general, and allied subjects. Each entry has the following format: serial number, title of the research project, name of the organization carrying out the work,

project leader/coordinator/director, associates, sponsoring agency, and duration of the project.

Projects included are those which were in progress in May 1977 or beyond. The publication also contains the subject, organization, investigator and sponsor indexes.

The publication (mimeographed; pp. viii + 280) is compiled and edited by Dr B.B. Sundaresan, Shri S.K. Kesarwani and Shri S.G. Bhat of NEERI.

Copies of the publication may be obtained from: The Director, National Environmental Engineering Research Institute, Nagpur 440020. □

R&D Planning in the Framework of National Plans

This is the title of a report arising from a study made by the Centre for the Study of Science, Technology and Development (CSSTD) of the Council of Scientific & Industrial Research. As the title indicates, the objective of the study was to relate R&D efforts to the national objectives as set out in India's 1974-79 socio-economic development plan. Such a study is important because, for the first time in India, a 5-year S&T plan (1974-79) was formulated by the National Committee on Science and Technology (NCST) with the objectives of integrating the S&T plan with the total national plan.

The report reveals that as little as 40% of the R&D outlays in the fifth plan period could be related to the realization of socio-economic objectives. This percentage includes outlays only on applied R&D programmes unambiguously 'civil' in orientation. Compared to the fourth plan (1969-74) outlay the fifth plan outlay on 'civil' research, which is predominantly applied in nature, as a whole shows a decline from 54.02 to 47.53%. The total outlay on applied civil research aimed at providing the basic needs (i.e. removal of poverty and attainment of self-reliance) over the 1974-79 period

amounted to nearly 48%. Schemes and projects aimed at promoting self-reliance accounted for 16% of the outlay, and R&D efforts aimed at employment generation amounted to only 3%.

The analysis of the total applied R&D efforts by NCST sectors shows that as much as one-third of the outlay was concerned with programmes in the agriculture sector, and two-thirds of the total R&D efforts were aimed at the realization of socio-economic objectives.

Another significant observation is that the programmes of the laboratories under the Indian Council of Agricultural Research were almost entirely those identified by NCST, whereas in the case of CSIR, only 22% of the outlay on applied research was on NCST-identified projects.

According to the report, a disturbing feature of allocation in R&D was that the resources were spread too thin over too many sectors/programmes. Pointing out that frequent shifts in the governmental policy in the matter of import of technology/product frustrate the R&D scientists, the report calls for a clear enunciation of a technology policy—a matter which is currently engaging the attention of the Government. Another suggestion made in the report is that the institutional framework and the mechanisms for R&D planning should be strengthened.

The conclusion of the study should not be viewed in isolation from the limitations of the study. While the entire range of activities (including administrative and R&D-supporting technical functions) forming an R&D system in respect of institutions covered by the study is covered, the R&D concept adopted does not take into account the activities relating to technology transfer. Another limitation is that private sector as well as states-sector R&D is not covered.

Copies of the report may be obtained by writing to Professor A. Rahman (principal author), Chief (Planning), CSIR, New Delhi 110001. □



CSIR NEWS

A SEMI-MONTHLY HOUSE BULLETIN OF CSIR

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Recent Advances in Non-Destructive Testing of Materials: Training Programme

The importance of the potential economic impact of quantitative non-destructive testing (NDT) can hardly be over-emphasized, particularly in the context of a developing country like India. Effective use of this technology leads to cost saving in quality control, materials, energy and manpower and timely detection of imminent catastrophic failures, thus leading to safety and product reliability. In view of these, a four-day training programme on 'Recent advances in non-destructive testing of materials' was organized at New Delhi from 18 April 1979. Sponsored jointly by the National Physical Laboratory (NPL), New Delhi; the Delhi Productivity Council; and the Ultrasonic Society of India, the programme was attended by 34 senior executives, technical officers and scientists working in the area of testing, inspection, quality control, maintenance, and R&D. Out of the eleven faculty members, seven were from the Ultrasonic Society of India (six from NPL and one from the Space Research Centre, Trivandrum) and others were from the Bhabha Atomic Research Centre, Bombay; the Welding Research Institute, Tiruchy; and the industries.

Inaugurating the course, Dr A.R. Verma, NPL's director, cited many methods conventionally used by the layman for testing and emphasized the importance of the latest sophisticated NDT techniques in modern industries for higher output, economical production and quality products.

Dr V.N. Bindal, Head, Ultrasonic

Instrumentation and Electroceramic Section, NPL, and President, Ultrasonic Society of India, in his keynote address, apprised the participants of the advantages and limitations of various NDT techniques and the application of ultrasonic surface waves in relation to various other techniques used for the surface inspection. Discussing the various types of waves, he explained how ultrasonic techniques could be used effectively to detect crack or flaw on the surface of a material, irrespective of the smoothness of the material.

A number of lectures were arranged during the programme. In his lecture Shri V.K. Gogia of NPL discussed how an ultrasonic probe is selected, designed and put to use for NDT of tubes, pipes, plates, etc. He also discussed the ultrasonic flaw detection in general. The use of X-ray NDT equipment in industries was discussed by Shri Krishnan. Dr K.B. Murti explained the various aspects of laser beam and radiation-based NDT techniques. Very recent techniques, viz. acoustic emission, ultrasonic holography and imaging, were also discussed. Dr Ashok Kumar of NPL introduced the acoustic emission technique and explained how it could be used while the test job was still under production without awaiting the job to be finally ready, thus leading to decrease in rejection rate and ultimate cost.

A two-day exhibition of NDT equipment, devices, components and materials manufactured in the country using indigenous technology as well as

of the equipment of foreign makes represented by local suppliers, was organized by the Ultrasonic Society of India. As many as eleven firms participated in the exhibition, and products relating to ultrasonics, dye penetrants, eddy current, and magnetic, metallographic and radiation-based techniques from 18 manufacturers were demonstrated. The exhibition registered enquires/orders worth Rs 10 lakh. The exhibition was inaugurated by Shri U. Venkateswarlu, Managing Director, Central Electronics Ltd, Sahibabad. □

Dr A. Roy

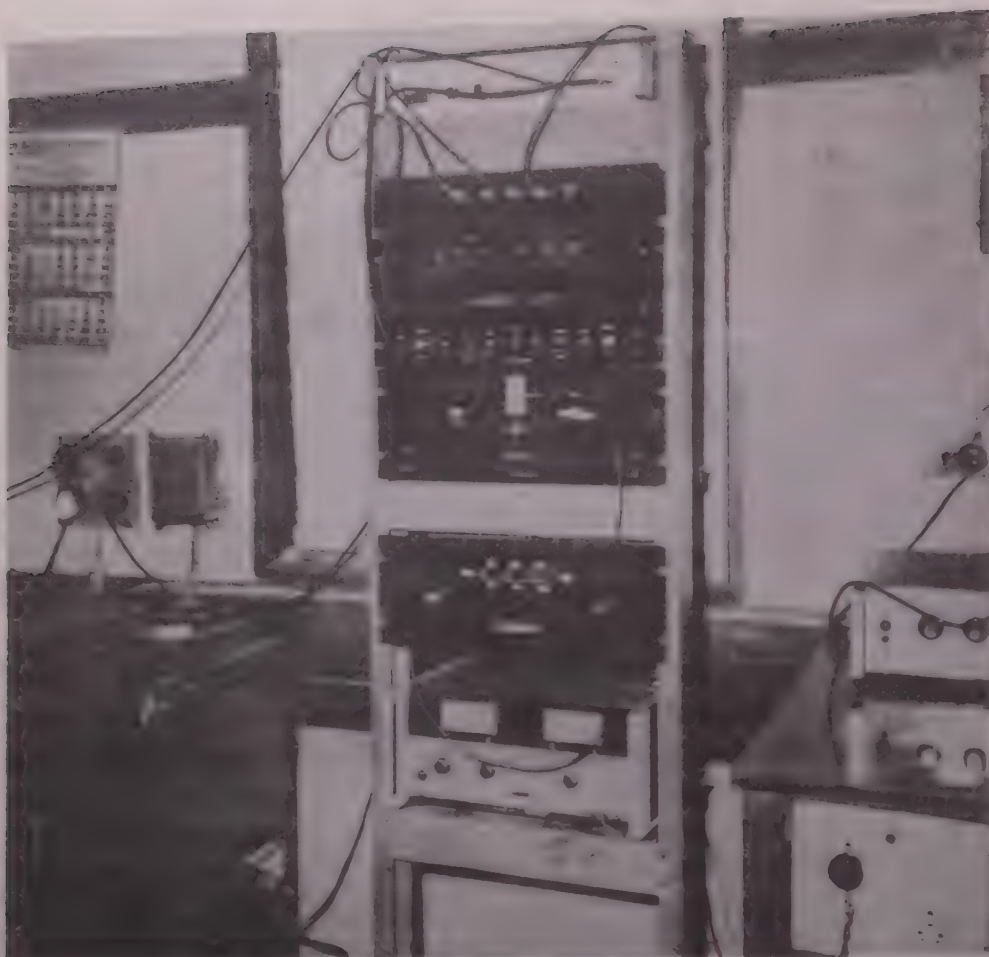
Dr A. Roy, Acting Director, National Geophysical Research Institute, Hyderabad, has been relieved of his duties to enable him to take up the assignment as an expert in applied geophysics at the University of Ibadan, Nigeria, under Unesco. Dr Roy has handed over charge to Dr S. Balakrishna of the laboratory (25 May 1979). □

Satellite Controlled Clock: NPL

The National Physical Laboratory (NPL), New Delhi, has developed and displayed a clock which is controlled and operated via a satellite, with all the

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Satellite controlled clock: NPL

clock controls at NPL's end. The clock gives time in year, month, day, hour, minute and second. One does not have to bother about setting the clock and about power failures. The time displayed is always the NPL's atomic time.

The clock was displayed in recent satellite experiments with the French-German satellite, *Symphonie*, at New Delhi, Ahmedabad, Madras and Calcutta. NPL, Delhi Satellite Station, Space Applications Centre at Ahmedabad, Madras Satellite Station, and the Portable Terminal Tract at Calcutta took part in these experiments.

The NPL clock when used with Indian domestic satellite, *INSAT*, in 1980s will find applications in science and technology and will be of great commercial use as public display clocks.

Work is in progress to try similar clock display using NPL's standard time high-frequency broadcast at 60, 30 and 20 meters which are available on a common man's radio.

Such clock displays are at present available only in a few technologically advanced countries. □

Distillation Still and Agarwood Chipper: RRL-Jorhat

Two recent developments which have resulted from the work of the Regional Research Laboratory (RRL), Jorhat, are an improved distillation still for extracting oil from essential oil bearing plants, and a chipper for crushing agarwood.

Improved distillation still

The conventional distillation stills used for extracting oil from essential oil bearing plants are not efficient, as in these stills, distillation has to be carried out for a longer duration as a result of which energy consumption is more. Another drawback is that the recovery of oil is only 60-70% of the total oil content. The improved distillation still developed by the laboratory incorporates a new type of steam injector in the steam-jacketed still to effect better distillation of steam through the plant materials. A condenser is also fitted on the lid to ease the operation. The

improved still yields about 90% of the total oil and cuts down the distillation time by 30%.

Chipper for crushing agarwood

The power-operated chipper for crushing the agarwood into pieces developed by the laboratory is more efficient than the cottage-scale primitive methods, employed in eastern India, which are crude, laborious and wasteful. Agarwood oil is a high-priced oil which finds extensive market in the Arabian countries. □

NCL Process for Indothrin

The National Chemical Laboratory (NCL), Pune, has synthesized a new insecticide, Indothrin, belonging to the synthetic pyrethroids group, starting from carene. Carene is a cheap and abundant byproduct of Indian turpentine oil.

Synthetic pyrethroids have become increasingly important insect control agents as they possess high insecticidal activity, low mammalian toxicity and fairly rapid biodegradability. Because of the unique combination of these properties, the synthetic pyrethroids are today considered as closest to the ideal among insecticides. Two of the presently important commercial products in this range are Permethrin and Cypermethrin.

Being closely related in structure to Permethrin, Indothrin exhibits a similar insect toxicity ratings or potency. For example, LD_{50} of crude technical Indothrin for the common housefly is ca. 20 ng per fly, which is the same as for Permethrin. Indothrin is also highly toxic to mosquitoes and cockroaches with LD_{50} in the range of 0.6-1.0 mg/kg body weight. One of the important features of the NCL process to be employed eventually on a commercial scale would be the involvement of 'ozonolysis' which is a comparatively pollution-free process.

Though an assessment of the full potential of Indothrin in agricultural pest control must await the results of

extensive field trials, the use of the insecticide in public health, animal health and domestic pest control appears fairly assured. Indothrin has been synthesized in the Organic Chemistry Division of NCL by a group led by Dr R.B. Mitra. Other members of the group are Dr G.H. Kulkarni, Dr K.G. Gore, Dr (Miss) Z. Muljiani, Dr G.D. Joshi, Dr A.S. Khanra, Dr P.N. Choudhari, Dr B.M. Bhawal and Shri P.N. Khanna.

This project forms a part of the NCL's overall programme of research on the development of pest/insect control agents. The process is covered by Indian Pat. 761/Del/78 and the corresponding international patent application. □

Management of Water Hyacinth

The Regional Research Laboratory (RRL), Jorhat, has been identified as the lead laboratory for planning and coordinating the execution of an inter-country collaborative research and development project for management of water hyacinth [*Eichhornia crassipes* (Mart.) Solms]. This conclusion was arrived at in a 4-day meeting of the Steering Committee and Project Planning Committee for Regional Rural Development Programme of the Commonwealth Science Council held in New Delhi from 15 to 18 November 1978. Leading scientists from different countries of Asia, Pacific Region as well as from Egypt and United Nations Environment Programme (Nairobi) took part in the meeting.

Later on, Dr M.N.G.A. Khan, Assistant Secretary, Commonwealth Science Council, London and Mr. P. Bifani, Chairman, Task Force, Environmentally Sound Appropriate Technology, UNEP, paid a visit to RRL-Jorhat and apprised themselves of the infrastructural facilities available at the laboratory.

The Commonwealth Secretariat has, during the last few years, devoted to the

task of bringing about economic development of the people of the Commonwealth countries. In order to find out some meaningful and practical means the Commonwealth Science Council (CSC), an organ of the Commonwealth Secretariat, organized a Regional Rural Technology Workshop in Dacca (Bangladesh) in January 1978 covering the Commonwealth Countries of Asia and the Pacific Region.

Dr G. Thyagarajan, RRL-Jorhat's director, was a member of a group of four experts who planned this workshop in detail. The workshop discussed and examined technologies suitable for rural settings in the areas of agro-based industries, shelter, clothing, health, transport, energy and employment. A number of important projects were identified in the Dacca workshop. In order to help CSC to follow up and implement the recommendations, a steering committee was constituted with one representative each from Bangladesh, India, Sri Lanka, Papua New Guinea and Seychelles. Dr Thyagarajan was the official Indian member of the steering committee.

Two of the projects proposed by the RRL director at the Dacca meeting attracted the attention and interest of UNEP. One of these projects was

concerning management of water hyacinth, an aquatic weed, which grows profusely posing serious environmental problem not only in India but also in other countries between 32°N and 32°S latitudes. The situation is more serious in tropical areas where it grows more vigorously and floats freely on water surface. It clogs drainage, ditches, irrigation canals and sewage pipes, interferes with navigation and hydroelectric power, harbours insects and impairs or destroys fishery and agriculture. At the same time, water hyacinth has potential value in pollution control, as a source of energy, food and fodder, fertilizers and other industrial products.

UNEP has shown interest in this comprehensive interdisciplinary project on water hyacinth management formulated by RRL-Jorhat and has decided to fund the project under the direction of Dr Thyagarajan who will be the regional coordinator. Other countries, viz. Bangladesh, Egypt, Guyana, Malaysia, Papua New Guinea, Seychelles and Sri Lanka, will also carry out investigations on selected areas under the responsibility of a national coordinator in each country. The national coordinator for India will be Dr J.N. Baruah, Deputy Director, RRL-Jorhat. □

REACTIVE FILTER FOR ALUMINIUM ALLOYS

NML's WORK*

Virgin aluminium is almost always contaminated with traces of elements like sodium, lithium and calcium. Moreover, the process of preparation of alloys additionally introduces other impurities such as dissolved hydrogen, oxide and dross. Together, these may adversely affect the mechanical properties, workability and stress corrosion behaviour. Although fibreglass filters

have long been used for removing macroscopic dross and oxide inclusions, they are not effective in reducing either the residual impurities including hydrogen or the sub-microscopic dross and oxide particles. The National Metallurgical Laboratory (NML), Jamshedpur, has developed a ceramic reactive filter to minimize or remove the above undesirable elemental impurities and non-metallic suspended particles. The ceramic reactive medium is used as a filter bed. It has the following salient features:

*Scientists working in this project at NML are: Dr Rajendra Kumar, Shri C.S. Sivaramakrishnan and Shri R.K. Mahanti.

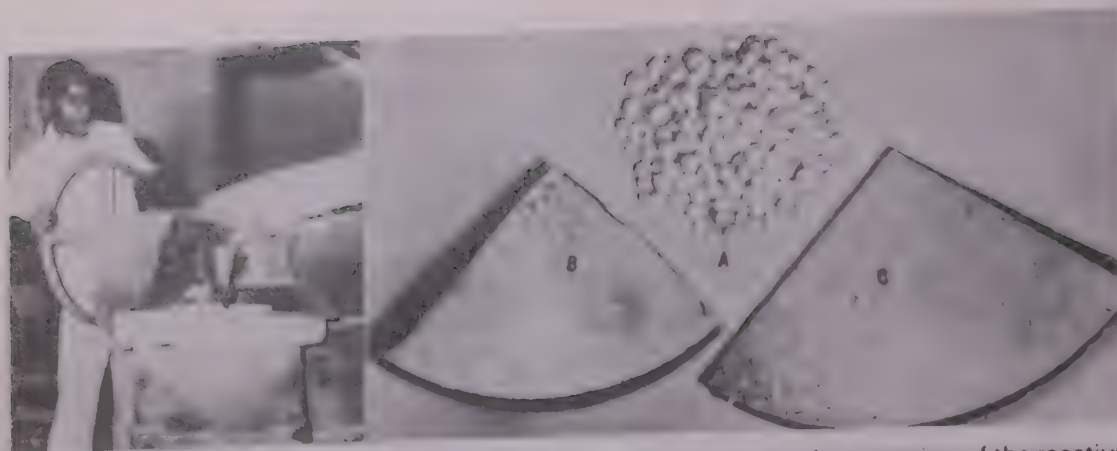


Fig. 1—NML reactive filter for aluminium and its alloys: (left) process of preparation of the reactive filter; A—reactive filter; B—cast without filter; and C—cast with filter.

1. The filter can be easily incorporated in the existing semi-continuous or continuous casting systems at any convenient location, allowing the molten metal to flow through the filter bed before it passes into the water-cooled moulds.

2. The inclusions and sodium levels are reduced by more than 50% in the filtered and solidified alloys and therefore lead to improved resistance to stress-corrosion cracking.

3. The filter refines the grain size and produces a uniform distribution of fine polyhedral grains across the longitudinal and transverse sections as compared to the marked grain size variation and appearance of large feathery grains in the conventionally cast alloys under otherwise identical conditions.

4. It reduces the tendency to hot tearing which is particularly severe in high-strength alloys.

5. It significantly improves the productivity of even difficult alloys in casting and extrusion shops.

The filter has undergone evaluation trials at the works of one of the leading producers of primary aluminium and leading aluminium alloy manufacturers and has consistently given good results. Apart from aluminium, commercial alloys of the series aluminium-copper, aluminium-magnesium, aluminium-magnesium-silicon and aluminium-zinc-magnesium have also been successfully filtered on tonnage scale. Figure 1 shows the filter in use with typical macro sections in support of the grain-refining

effect of filtration in aluminium-zinc-magnesium alloy.

In the conventionally cast 400 mm diam billets, distinct zones of different grain sizes reflecting different modes of solidification are obtained, and in the filtered and solidified billet, uniform distribution of fine grain size is ensured.

The production of the ceramic reactive filter requires equipment to mix ceramic powders and chemicals; equipment to make pellets; and furnace to fire the pellets at a minimum temperature of 1500°C. □

PROGRESS REPORTS

RRL-Jammu Annual Report: 1977

The annual report of the Regional Research Laboratory (RRL), Jammu, for 1977, brought out recently, shows that the laboratory carried out its research programmes in the following disciplines: Applied botany, Applied microbiology, Chemical engineering and design, Cellulose pulp and board, Food technology, Fur and wool technology, Insecticides and insect physiology, Minerals, Mycology and plant pathology, Organic chemistry, Pharmacology, Surface coating, Plant survey, Industrial survey, Rural technology and Instrumentation. The laboratory handled 28 consultancy services and four sponsored jobs. The technology for production of citric acid by fermentation was handed over to Andhra Citrate Ltd, Hyderabad. The laboratory successfully designed, fabri-

cated and operated the fermenters of capacity 75, 500 and 4000 litres. On the basis of the data collected on the performance of these fermenters the laboratory provided design details of a plant of capacity 400 tonnes/annum to Andhra Citrate Ltd. The technology will require an investment of about Rs 2 crore. Another noteworthy achievement of the laboratory was the transfer of menthol technology to Burma. The laboratory was retained by the National Research Development Corporation of India (NRDC) for setting up a pilot plant on turn-key basis for the production of menthol from mint oils in Burma. The plant, with a capacity of 3 tonnes/annum has cost Rs 3 lakh. This is one of the 10 pilot plants that the Indian government is gifting to Burma.

Under the rural development programme of the laboratory, studies were made on the fishery technology and solar driers. The pattern of growth of silver carp (*Hypophthalmichthys molitrix* Val.) and grass carp (*Ctenopharyngodon idella* Val.) introduced in 1976, showed that both these fishes were well suited for cultivation in Jammu waters. The laboratory designed and fabricated a solar drier for speedy and hygienic drying of apricot in the Ladakh region. The drier reduces drying time substantially and gives a cleaner product with longer storage life, better flavour and more attractive appearance as compared to that obtained traditionally by drying under the open sun. The drier costs Rs 500 and can be fabricated locally with indigenous materials.

The laboratory supplied the design drawings for a diosgenin plant (batch capacity, 500 kg of hydrolyzed drug) to the Directorate of Cinchona and Other Medicinal Plants, Government of West Bengal. The laboratory also developed an economical method for the manufacture of progesterone. Three kilograms of this drug have been sold at a rate of Rs 10,000/kg. The process was being handed over to two firms.

In view of the importance of Kenaf (*Hibiscus cannabinus*) as a possible raw

material for the pulp and paper industry the laboratory tried the cultivation of Kenaf in Jammu. It was found that two indigenous varieties of Kenaf, viz. HC-583 and AMC-108 were better than the American and the Cuban varieties in respect of yield, height and girth of stems, and resistance to diseases. Of the two indigenous varieties studied, HC-583 was found to be superior to AMC-108 and was therefore selected for further agronomical studies.

The work carried out by the Cellulose Pulp and Board Division related mainly to the utilization of agro-industrial wastes. Fibre boards were made using low-temperature thermomechanical pulping method from pine needles, rice straw, eucalyptus, pine wood and willow (*Salix alba*). A technique was developed for making fibre angle joints from rice straw, Cymbopogon grass and other fibrous materials. These angles can replace the wooden battens for fabricating boxes out of fibre boards.

The laboratory developed a process for the production of dental grade plaster of Paris from locally available raw material. The technology has been released to Plastona Industries, Pune. Experiments were also conducted to manufacture ceramic grade plaster of Paris. The plaster made for this purpose has been sent to different ceramic industries for evaluation.

The patented process for the production of colchicine from *Gloriosa superba* has been released through NRDC to Kothari Phytochemicals International, Madurai. The process was demonstrated on a pilot plant scale (40 kg/batch). A process has been developed for the isolation of colchicine from the seeds of *G. superba* on a bench scale. The yield of colchicine from the seeds was about 0.3%. The method of production of xanthotoxin from *Heracleum candicans* roots was demonstrated to Kulu Aromatics, Kulu.

Ergot production was continued at various research farms of the laboratory. About 16,200 bottles of the ergot inoculum, ergotamine strains, prepared during the year were supplied to

different drug farms of the Central Institute of Aromatic and Medicinal Plants (CIMAP), Lucknow. Work was continued on the improvement of ergot strains for higher alkaloid content.

The laboratory also carried out a study on the preparation of hardened rosin, estergum, maleic resin, maleic adduct, alkyd type oleoresinous compositions and varnishes.

One hundred and thirty-three research papers were published during the year. □

NEERI Annual Report: 1977

The annual report of the National Environmental Engineering Research Institute (NEERI), Nagpur, for the year 1977, published recently, shows that during the year the institute pursued 75 research projects (of which 38 were sponsored by public and private sector industries), eight collaborative projects and 73 consultancy assignments. National projects on algae and complete treatment of night soil and utilization of the byproducts were pursued under the All India Coordinated Projects funded by the Department of Science and Technology.

Scientific methodology to monitor the air quality in Bombay and Calcutta metropolitan areas constituted two major activities during the year. Monitoring of ambient air quality in eight cities, viz. Ahmedabad, Bombay, Calcutta, Delhi, Jaipur, Hyderabad, Kanpur and Madras, is being carried out regularly. NEERI is assisting the Municipal Corporation of Greater Bombay to set up an air quality monitoring station and surveillance laboratory. The institute was recognized as a collaborating centre for South East Asia by WHO in the areas of air pollution, community water supply and waste management.

A project on slow sand filtration for rural communities was undertaken in collaboration with the WHO International Reference Centre in Community Water Supply, the Hague,

Netherlands. In the first phase of the programme, applied research was undertaken to develop practical guidelines for design, construction and operation of slow sand filters appropriate to tropical conditions. This will be followed by full scale demonstration plants in selected villages in different parts of India. Their performances and operational aspects will be evaluated for wider application. A report on the design, construction and operation of slow sand filters has been submitted.

The Solid Wastes Group has characterized solid wastes and evolved appropriate designs for mechanical composting plants for various cities including Kota, Ajmer, Hyderabad, Bikaner, Surat, Pune and Thana. Based on these studies, feasibility/project reports have been provided for installation of mechanical compost plants. A small retort type multichamber incinerator to burn 110 kg of solid wastes per hour has been designed and constructed in the laboratory's premises. It is to be operated as a research-cum-demonstration-cum-utility incinerator. Studies are being initiated to evaluate its performance. The laboratory participated in the United Nations Environment Programme (UNEP) by completing a project on 'Identification and preparation of an inventory of organisations having capabilities in air and water pollution monitoring in ESCAP region'. NEERI is continuing to participate in the WHO/UNEP Air Quality Monitoring Project under the Global Environmental Monitoring System Programme.

In one of the pilot projects under the rural sanitation programme, NEERI constructed 800 hand-flushed water-seal latrines in eight experimental villages near Nagpur, with active participation and involvement of the Zilla Parishad and village panchayats. The feasibility of low-cost super-structures for latrines with locally available material is being considered. Simultaneously, disinfection of wells and epidemiological assessment are being carried out with a view to evolving an effective metho-

dology for implementation of rural sanitation programmes.

Field experiments on using raw sewage diluted with water and fortified with inorganic nutrients showed that crop yield increased by about 12-60% in comparison with conventional irrigation practices. In the initial stages of wheat, moong and paddy crops with sewage as irrigation water, yield appeared to be less for the first crop but subsequently the yield exceeded that from normal practices. In sewage irrigated soils, all the ions present in sewage accumulated with decrease in pH of soil. These ions with adequate rainfall and proper soil drainability could be leached away. These were considered in a project sponsored by the Bombay Municipal Corporation on sewage disposal by irrigation.

In a demonstration plant for the complete treatment of night soil and

utilization of byproducts, the per capita contribution of night soil was 64.7 g/day on total solids basis. 3.5 kg of volatile solids/m³/day showed volatile solids destruction of 40-45%. Per capita gas production per day was 25 litres with 60-65% CH₄, 30-35% CO₂ and 0.05-1% H₂S. During the year, 55 project reports were published. Two booklets, viz. 'Sanitation Facilities for Slums and Rural Areas' and 'Rural Latrines' were brought out.

The laboratory earned Rs 4.95 lakh from the consultancy services rendered to various private industries and quasi-government agencies connected with industrial development. One hundred and seven scientists, engineers and technicians from industries, government departments, engineering colleges and universities participated in the nine training courses organized by the laboratory. □

classifier hammer mill, vessels and trays for handling materials are the equipment needed. All these are available indigenously.

The capacity of an economically viable commercial plant as suggested by CFTRI is 225 kg of garlic powder per day (or 750 kg of garlic bulbs per day). The land required for a unit of this capacity is 2400 sq. ft for plant and building and another 2400 sq. ft for storage of raw materials and finished products. The total investment required for the plant is Rs 2.5 lakh (excluding the cost of land and building). The cost of production of garlic powder has been estimated at Rs 15,000/tonne.

Further details can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, New Delhi 110024. □

Calcium Silicide

The Central Electrochemical Research Institute (CECRI), Karaikudi, has developed a process for the production of calcium silicide. The process consists in the mixing of calcium oxide, ferrosilicon and calcium chloride in a definite proportion. The mixture is then fed into water-cooled arc furnace equipped with three graphite electrodes arranged in a triangular set-up. On completion of the melting of charge in course of 3-3½ hr, sufficient cooling time is given before the product and slag are removed. The product is then analyzed for its quality.

Calcium silicide finds application as deoxidizing and desulphurizing agent in the iron and steel industry, and for the production of smokescreen, ignitors for tracer projectiles, etc. in Defence. Besides its application as primer for explosives and as an inoculant in the production of meccanite casting, it is used in the production of modular cast and heat resisting cast from alloys. Calcium silicate slag which is obtained as a byproduct finds application as a filler in road construction. It is also used in heat insulating.

Calcium silicide is not known to be produced in the country and the entire

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Garlic Powder

Garlic Powder is used as a condiment in food preparations and carminative and gastric stimulant in medicinal preparations. As a condiment, it is used for flavouring mayonnaise and tomato ketchup or sauces, salad dressings, meat sausages, gravies, stews, spaghetti, chutnies, pickles, curried dishes, etc. It aids in digestion and absorption of food. For its anthelmintic and antiseptic properties it is used in a number of medicinal preparations.

The manufacture and marketing of garlic powder is a well established industry in USA and Europe. In India, though garlic is grown abundantly and consumed as such, no efforts have so far been made to produce dehydrated garlic or garlic powder with the result that nearly 20% of the crop is wasted owing to respiration, transpiration and microbiological spoilage during storage.

The conventional technique of making garlic powder consists in the removal of the outer papery skin of the garlic bulb and separation and peeling

of cloves manually, dehydrating and powdering them before packing. This technique is tedious, labour and time consuming and hence costly. The Central Food Technological Research Institute (CFTRI), Mysore, has developed an improved process for the production of dehydrated garlic powder free from husk. In the CFTRI process garlic bulbs are broken and the cloves and the papery husk are separated by aspiration. The cloves are mechanically pre-conditioned and dried. The dried material is passed through a pulper to separate the thick adhering husk from the meat. This mixture is pneumatically separated and the dried meat is powdered to obtain the product.

The process has been investigated in the laboratory on a 10 kg batch scale. A pilot plant having a capacity of 100 kg/day has also been set up and operated. The product obtained conforms to IS specifications.

Flaking rolls, through-flow drier (two in number with trays, temperature range 60-80°C), pulper with nylon brushes, air

indigenous requirement is met by imports; 161 tonnes of calcium silicide were imported during 1976-77 at a cost of Rs 17.56 lakh. In view of the increase in the production of iron and steel and the corresponding development of iron and steel casting industry, the demand of calcium silicide is likely to grow.

CECRI has studied the process on a 27-30 kg/batch scale with an operating duration of 3-3½ hr.

Calcium oxide, ferrosilicon and calcium chloride are the main raw materials required in the process. All these are available indigenously. The items of plant and machinery required in the process are: furnace transformer (650 kVA), choke (iron cored, air cooled), capacitors, tap changer, furnace shell, bogies, electrode motor pumps, jaw crusher, screens and grizzly.

The suggested capacity of an economic unit is 100 tonnes of calcium silicide per annum. The total investment to put up such a unit is estimated at Rs 12.41 lakh (Fixed capital, Rs 7.41 lakh; and working capital Rs 5.00 lakh).

The cost of production works out to be Rs 16/kg.

Further particulars can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, New Delhi 110024. □

PATENTS INFORMATION

Indian Pat. 70/Cal/76*

Process for the electrochemical preparation of arylalkylamines such as benzylamine and β -phenylethylamine

H.V.K. UDUPA, V. KRISHNAN, A. MUTHUKUMARAN & K. RAGHUPATHY

Central Electrochemical Research Institute, Karaikudi

Benzylamine and β -phenylethylamine are important drug intermediates and corrosion inhibitors. Their annual demand, which is of the order of 30-50 tonnes, is met mainly through imports. The Central Electrochemical Research Institute (CECRI), Karaikudi, has developed an economical route for the

preparation of these chemicals.

The process consists of two steps. The first step is the preparation of deposited nickel black cathodes over graphite substrate by employing a solution of nickel ammonium sulphate in an appropriate concentration. The deposition is carried out at a high current density and at a low temperature. The second step is the reduction of phenyl cyanide and benzyl cyanide in ethanolic sulphuric acid by the use of nickel black cathodes. Benzyl cyanide can also be reduced in aqueous ethanolic ammonium sulphate medium. In both these media, free amine is liberated by neutralization with sodium hydroxide, and the amine purified by distillation. Good yields of amines have been obtained in both the cases.

This method can be extended to the preparation of any other aryl alkylamine. □

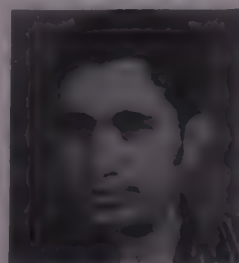
PERSONNEL NEWS

Honours & Awards

Dr Negi Elected Fellow of Royal Astronomical Society of London

Dr J.G. Negi of the National Geophysical Research Institute, Hyderabad, has been elected a Fellow of the Royal Astronomical Society of London, UK. The Royal Astronomical Society was founded in 1820 and promotes the fields of astronomy and geophysics through publication of journals, holding of professional meetings, etc.

Dr Negi, who is the Area Chairman, Properties of the Earth's Interior, at NGRI, is a leading theoretical geophysicist of the country and was awarded the Krishnan Gold Medal (1973) of the Indian Geophysical Union for his outstanding research contributions in geoelectromagnetism. He has received a number of honours earlier. He was Visiting Fellow at the



university of Colorado, USA; Visiting Professor in geophysics at the Federal University of Bahia, Salvador (1975-77) and Federal University of Para, Belem (1977) in Brazil; Guest Visiting Scientist of the National Science Foundation, USA, Academy of Sciences, Romania, Academy of Sciences, Hungary; member of the Consulting Editorial Board of 'European Journal of Pure and Applied Geophysics' and Co-Chairman of the International Group on the Properties of the Earth's Interior of the International Geodynamics Commission. He is also member of a number of learned societies, expert committees and academic bodies.

Dr Negi has contributed more than 100 research papers in various national and international journals (including *Geophysical Journal*, *Royal Astronomical Society*) and supervised the doctoral work of 20 research workers in India and Brazil. He has edited *Geophysical Research Bulletin* (1972-77) and 'Proceedings of a national seminar on solid earth geophysics'. □

PATENTS FILED

963/Del/78: Adaptive background compensator, J.P. Pichamuthu, S.N. Iyer & D. Sundararajan—NAL, Bangalore.

966/Del/78: Improvements in or relating to sealing of anodized aluminium and its alloys, B.A. Shenoi, S. John & A. Perumal—CECRI, Karaikudi.

967/Del/78: Cationic fatliquor from vegetable oil, K.I. Vijayalakshmi, D.R. Rao, V.V.M. Rao & R. Selvarangan—CLRI, Madras.

20/Del/79: A process for the preparation of new yellow benzanthronyltriazine disperse dyes for synthetic fibres, N.R. Ayyangar, R.J. Lahoti & D.R. Wagle—NCL, Pune.

47/Del/79: A process for the synthesis of 1-D-(β -pyrrolidino-ethoxy)phenyl-2-D-substituted benzyl-6-6-methoxyl-1,2,3,4-tetrahydronaphthalenes as anti-fertility agents, S.C. Tiwari, S.N. Rastogi, Nitya Nand & H. Chandra—CDRI, Lucknow. □

CSIR SCIENTIFIC PERIODICALS

JOURNAL OF SCIENTIFIC & INDUSTRIAL RESEARCH (monthly)

With a fine record of over 37 years service to the scientific community, this journal has grown into India's leading general science periodical. Intended to fulfil the responsibility of helping the research workers to keep themselves abreast of current developments in various fields of science and technology, the journal carries editorial features highlighting important scientific events in India and abroad; articles on science policy and management of science; review articles on topics of current research interest; technical reports on international and national conferences; reviews of scientific and technical publications; and notes on major advances in various fields.

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Section A: In the 17th year of publication, the journal is devoted to papers in Inorganic, Physical, Theoretical and Analytical Chemistry.

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This journal, which is running 17th year of its publication, is devoted to original research communications (full papers and short communications) in all conventional branches of physics (except radio and space physics).

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Annual subscription	Rs 60.00	£ 10.00	\$ 25.00
Single copy	12.00	2.00	5.00

INDIAN JOURNAL OF TECHNOLOGY (INCLUDING ENGINEERING) (monthly)

This journal publishes papers reporting results of original research of applied nature pertaining to unit operations, heat and mass transfer, products, processes, instruments and appliances, etc. The journal is of

special interest to research workers in the departments of applied sciences in universities, institutes of higher technology, commodity research laboratories, industrial cooperative research institutes, and industrial research laboratories.

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Single copy	6.00	1.00	2.50

INDIAN JOURNAL OF EXPERIMENTAL BIOLOGY (monthly)

This journal, devoted to the publication of research communications in the fields of experimental botany, zoology, microbiology, pharmacology, endocrinology, nutrition, etc., is the only one in India with such a wide coverage and scope.

Annual subscription	Rs 120.00	£ 20.00	\$ 50.00
Single copy	12.00	2.00	5.00

INDIAN JOURNAL OF BIOCHEMISTRY & BIOPHYSICS (bimonthly)

This journal, published in association with the Society of Biological Chemists (India), Bangalore, is the only research journal in India devoted exclusively to original research communications in biochemistry and biophysics.

Annual subscription	Rs 40.00	£ 7.00	\$ 17.00
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INDIAN JOURNAL OF MARINE SCIENCES (quarterly)

Commencing publication from June 1972, this journal is devoted to research communications (full papers and short communications) pertaining to various facets of marine research, viz. biological, physical, geological and chemical oceanography.

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RESEARCH AND INDUSTRY (quarterly)

Intended to serve as a link between science and industry, this journal is addressed primarily to technologists, engineers, executives and others in industry and trade. It publishes informative original articles containing practical details of processes and products developed in India, which show promise of ready utilization, and technical digests on new processes, products, instruments and testing methods which are of interest to industry. Developments in Indian industry are regularly reported.

Annual subscription	Rs 24.00	£ 4.00	\$ 10.00
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INDIAN JOURNAL OF TEXTILE RESEARCH (quarterly)

Commencing publication from March 1976, this journal is devoted to the publication of papers reporting results of fundamental and applied researches in the field of textiles.

Annual subscription	Rs 36.00	£ 6.00	\$ 15.00
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CSIR NEWS

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Automatic Visual Range Assessor: NAL

In modern flying operations during bad weather, blind-flying aircraft may be instrumentally guided to points very close to the landing zone. The pilot will

have to commence his landing approach almost immediately thereafter. If after committing his aircraft to land, the pilot finds that the visibility is too low for a

safe touchdown, he will have a margin of only a few seconds to initiate corrections to regain altitude. This involves a delicate and potentially dangerous manoeuvre by a heavy aircraft travelling at nearly 100 metres per second. On the other hand, economic imperatives forbid frequent, unscheduled diversions based on unduly pessimistic reports of visibility. Therefore, to satisfy the requirements of safe yet reasonably economic flying operations, accurate quantitative reports of runway visibility are required. The maximum distances at which non-luminous and luminous objects can be just barely perceived are generally different. The former is known as the daylight visual range (DVR) and the latter as the runway visual range (RVR). For flying operations the nonluminous objects of interest are usually runway markings and the luminous objects are the runway edge lights.

The RVR is sometimes measured by a human observer looking down the runway to count the number of edge lights he can see. Such measurements will suffer from subjective errors and inconsistencies. To eliminate human inaccuracy and limitations, it is necessary to continuously measure and report DVR and RVR with accurate, quick-acting, automatic instruments.



A view of the AVRA transmissometer developed at NAL. The top shelf contains the laser transmitter (*right*) and photo-detector (*left*); second shelf contains the laser power supply and detector preamplifier; and the third shelf contains the PCM transmitter and the background luminance monitor. Air conditioner is placed at the bottom.

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Such a system requires field sites deployed at different points alongside the runway, containing instruments that continuously measure atmospheric transmittance and background luminance. The data obtained by these instruments have to be remoted to a central processing unit (CPU). The on-line CPU computes, displays and prints out the DVR and/or RVR.

The National Aeronautical Laboratory (NAL), Bangalore, has developed an automatic visual range assessor (AVRA) that performs all the above functions. Airconditioning and defogging of the field site instrumentation are done to render the system insensitive to ambient temperature and humidity effects. Moreover, extensive tests indicate that AVRA is insensitive to background light, is free from dazzle, and is radio silent. A brief description of the AVRA sub-systems follows:

The atmospheric transmission is measured with a transmissometer over a 10 m sampling path that is folded to provide a 20 m base line. The measurement is made by projecting the output of a low power GaAs injection laser over the base line and determining its attenuation. The laser output power and energy densities (0.1 mW/cm^2 average and $0.1 \text{ } \mu\text{J/cm}^2$ per pulse) are well below the prescribed eye-safe threshold.

A silicon detector is corrected with an appropriate filter to have a spectral response similar to that of the photopic eye. This corrected detector is used to measure the background luminance.

A pulse-code modulated transmitter digitizes the output data from the transmissometer and the background luminance monitor, and transmits it to distances of up to 5 km over twisted pair wires.

Each of the above sub-systems are in cabins at every field site near the runway. The data from each field site is sent to a remote location where the CPU is located. The CPU computes DVR and RVR and reports them in the form of luminous 7-segment displays and

teleprint printout. The computation is performed by a dedicated, hard-wired analogue computer of the NAL design and make.

The AVRA unit has several advantageous design features. These include the use of a double-beam transmissometer, a high sampling rate (laser pulse rate, $\sim 1 \text{ kHz}$) and fine quantization (256 levels of the background luminance). The SKOPOGRAPH (Denmark) now in use at some airfields in India uses a single-beam transmissometer, a low sampling rate ($\sim 1 \text{ Hz}$) and coarse quantization (4 levels) of the background luminance. The AVRA costs approximately 50% of the SKOPOGRAPH and has a foreign exchange component of about 10%.

The observed stability of the AVRA is better than that reported of other foreign makes that are more modern than the SKOPOGRAPH. No quantitative reports are available with the laboratory about the SKOPOGRAPH's stability.

For the following two reasons a short sampling path (10 m) is used: (i) it is optimal for the ICAO recommended visibility reporting ranges between 30 m and 1500 m, and (ii) it is useful to know the visibility at selected, well defined locations along the runway. Thus if the fog is concentrated at the threshold end, the visibility averaged over the entire runway (for example by using a long base-line transmissometer) will be optimistically high. If an optimistic value is reported, it may dangerously mislead the pilot who will unexpectedly enter a region of low visibility when approaching the touchdown point.

The NAL's prototype system has been running continuously for a year. During this period, only minor and easily rectifiable failures of one or two electronic components occurred. Although the prototype uses just one field site, the system is modular, and as such up to 5 additional field sites could be incorporated, if required.

Further details on this system can be had from: The Director, NAL, Bangalore 560017. □

New Pedal Pump for Lifting Water

Manually operated devices are widely used to lift water for irrigation in rural areas. These devices have varying performance characteristics satisfying various needs. For instance, the 'pedal wheel' may have a head of as low as one foot and a discharge of as high as 18,000 litres/hr, while the 'counterpoise lift' may have a head of as high as 10 feet and a discharge of as low as 2000 litres/hr. The popular 'Don' has an average discharge of 2000 litres/hr at a head of three feet.

The Central Mechanical Engineering Research Institute (CMERI), Durgapur, has developed a new pedal pump whose average discharge is 6000 litres/hr at a head of six feet. This medium head, high discharge pedal pump is likely to find wide application in



The CMERI pedal pump in operation

lift irrigation as the unit cost of the pump and its maintenance will be well within the reach of an average Indian farmer.

The pedal pump designed and developed at the laboratory can be operated by a person standing on the foot pedal. As the person changes his body posture his body weight is transferred causing movement of a diaphragm whereby suction is created in one chamber for lifting water, and at the same time, discharge of water from

another chamber takes place. Depending on the operator's capacity pump head can be increased to 10 feet.

The overall dimension of the pump is length, 875 mm; width, 490 mm; and height, 575 mm. The unit weighs about 35 kg.

The design of the pump is available for commercial exploitation. It is estimated that a small industry with capital investment of Rs 2 lakh can produce 200 units/month. Each unit will cost about Rs 250. □

Chemical Dispersant for Beneficiation of Iron Ore

RRL—Jorhat's Work

India is endowed with vast reserves of iron ores which contain high percentage of alumina. For achieving optimum level of productivity through the modern blast furnace technology the iron content in the ore should be above 60%, $\text{Al}_2\text{O}_3/\text{Fe}$ ratio should be less than 0.05 and $\text{Al}_2\text{O}_3/\text{SiO}_2$ ratio must be less than 1. This requires adoption of a suitable ore dressing/beneficiation technique to run of mines (ROM) ores. Large scale mechanization of mining operation and subsequent ore dressing through crushing and screening liberate enormous quantity of fines (40% of ROM ore) which are unsuitable for charging into blast furnace. The fines need agglomeration through a process of sintering and/or pelletization to prior feeding into blast furnaces. Ore fines contain more of alumina and silica than graded ore and need upgrading for producing quality agglomerates. Besides, in India, we have substantial deposits of lateritic iron ore, low in iron content, which cannot be put into any direct use without beneficiation. It is, therefore imperative to conserve this valuable mineral and maximize use of low grade iron ore and fines through a suitable process of beneficiation.

The conventional method of iron ore beneficiation as practised in India is that of simple water washing. The ore after necessary crushing is scrubbed with water, screened through various types of

screens and classified to remove substantial quantity of gangue. But this practice does not significantly remove lateritic materials associated with the ore. The washed ore contains high alumina and this high alumina input in relation to iron and silica in iron ore burden leads to production of slag in blast furnace. Blast furnace slag with alumina in excess of 16% is highly viscous and needs higher temperature for attaining sufficient fluidity to facilitate easier separation of molten iron from slag. The consequences of high alumina input are: reduced blast furnace productivity, increased coke rate, improper quality of hot metal and adverse operating conditions.

RRL-Jorhat's efforts

The Regional Research Laboratory (RRL), Jorhat, started its efforts to find a solution to the problem of alumina removal from iron ore rich in alumina in 1972. The efforts resulted in the development of a number of chemical dispersants which are specific in action on hydrous materials like clay and laterite. Laboratory scale investigations carried out with these chemicals and various iron ores of India yielded encouraging results.

Attracted by RRL-Jorhat's achievements, Hindustan Steel Ltd (HSL) intended to collaborate with the laboratory for further development of

the technique, and a note of understanding was arrived at between HSL and RRL-Jorhat in 1974 aiming at speedy implementation of the project and eventual commercialization of the technology. A scale-up unit for production of 200 kg/batch of the dispersant chemical was set up and a series of bench scale laboratory tests for beneficiation of iron ore were carried out at RRL-Jorhat, Bhilai and Tata Iron and Steel Company using the RRL-Jorhat's chemical and adopting various methods of water-washing technique. This was followed up by a short duration plant trial at Barsua washing plant in May 1975, and this indicated the effectiveness of the chemical in the removal of clay and lateritic material from the ore in dispersed phase.

Encouraged by the result of the plant trial at Barsua, a task force was formed involving the personnel from Barsua Iron Mines, Rourkela Steel Plant (RSP) and R&D organization of HSL, which recommended the augmentation of production of RRL-Jorhat's chemical for sustained washing plant trials. R&D(HSL) extended financial assistance to the laboratory for setting up of a pilot plant to produce the necessary quality of dispersant chemical for carrying out sustained trials at Barsua iron ore washing plant.

A pilot plant (one tonne/batch) was set up by RRL-Jorhat based on the data obtained by operating the 200 kg scale-up unit and 20 tonnes of dispersant chemical were prepared. Sustained trials for four days were carried out at the Barsua washing plant. RRL-Jorhat, R&D(HSL), RSP and Barsua iron ore plants personnel took part in all the trials. After critical analysis of the results, a techno-economic report was prepared by HSL. The overall performance was satisfactory and it could remove 17% more Al_2O_3 by the chemical as compared to simple water washing with the corresponding reduction in $\text{Al}_2\text{O}_3/\text{Fe}$ ratio from 0.044 to 0.08. The net cost benefit that may be derived following the new technique of beneficiation was estimated to be Re 1 per

tonne of hot metal in case the present level of sinter burden in the blast furnaces of Rourkela Steel plant was maintained. It was also estimated that net cost benefit would be Rs 1.40-3.20 per tonne of hot metal with increased use of sinter in the burden prepared out of beneficiated fines using the RRL-Jorhat chemical. The reduction of $\text{Al}_2\text{O}_3/\text{Fe}$ content by 0.01 in the blast furnace burden is likely to bring about a saving of Rs 7.50 per tonne of hot metal produced. The above cost economics did not consider the increase of productivity in the blast furnace by way of reduction of slag volume and increase in blowing rate. The calculation was based on material balance only. Actual techno-economic effect, however, is expected to be higher, particularly in view of the large drop in $\text{Al}_2\text{O}_3/\text{Fe}$ ratio, the exact quantum of which has to be established by actual blast furnace trials.

HSL proposes to go ahead with the programme of large scale beneficiation and evaluation of the sinter in actual blast furnace condition. The know-how has been released to Allied Resins & Co. Ltd, Calcutta, for its production and supply. It is expected that with commercial production of the additive and subsequent successful washing trials at Barsua Iron Mines with different ores will ultimately solve the chronic problem of alumina removal from Indian iron ores, improve upon the quality of agglomerates produced out of beneficiated ore fines and open avenues for utilization of low-grade iron ores and ore fines. □

Mica Based Textured Coating

The Central Glass and Ceramic Research Institute (CGCRI), Calcutta, has developed a textured coating based on mica powder. It is comparable to the well known 'KENITEX' textured coating used extensively in USA, Japan and other developed countries.

The coating has been developed specially for the protection and

decoration of exterior surfaces. It is ideal for metal, concrete, masonry and wood surfaces. One or two coats are sufficient to fill holes and cracks and hide building defects without affecting the architectural lines. It is highly flexible and it withstands normal expansion and contraction of buildings. It provides texture, fire resistance and insulation and is highly durable and weatherproof. It can be applied by spraying and is free from chipping, flaking or peeling.

The coating is more economical than conventional painting particularly in consideration of the former's outstanding merits. It is ideal for application in industrial plants, commercial buildings, hotels, schools and houses.

The coating has the following properties:

Drying time (touch) ..	8 hr
Covering power ..	about 1 m ² /litre
Flexibility ..	does not crack when bent over 2.5 cm radius
Fire resistance ..	excellent
Adhesion ..	excellent; requires 20 kg to pull the surface
Colour retention ..	excellent; no change after 70 hr exposure to ultra-violet rays
Water resistance ..	excellent

The capital investment required for a unit which would produce 200 litres of the coating per day is Rs 2.5 lakh, comprising Rs 1.0 lakh as fixed capital and Rs 1.5 lakh as working capital. The cost of production is estimated at Rs 13.50/litre. □

Cytopathological Effects of Lindane

Cytopathological effects of lindane on goat and some other experimental animals were studied by Shri Kalyan Kumar Datta of the Industrial Toxicology Research Centre, Lucknow. The studies have indicated that lindane, when given in sublethal concentrations, induced varied toxic symptoms in laboratory rat but not in goat. The pathological lesions were not with intraperitoneal and oral route of administration but through dermal absorption. Histochemical studies re-

vealed that lindane altered the liver-lipid picture. Cytogenetic screening of bone marrow and spermatogonial cells of rats after lindane treatment showed no significant chromosomal aberrations. The study suggested the interspecies variations in laboratory rat and domestic goat.

For his thesis based on these studies Shri Datta has been awarded Ph.D. degree (1978) of the Agra University. The studies were carried out under the supervision of Dr T.S.S. Dikshith of the laboratory. □

Deputation Briefs

Dr B.N. Mehrotra of the Central Drug Research Institute (CDRI), Lucknow, participated, as an invitee, in the 'Biological phytochemical orientation and problem workshop for botanical collaborators' organized by WHO during 8-11 May 1979 in the Department of Pharmacognosy and Pharmacology of the University of Illinois at Chicago.

In the workshop, discussions were held on various problems concerning plant collection and identification, processing plant samples for chemical and biological screening and documentation of data. Dr Mehrotra took part in the discussions and referred to his publication 'Processing of plant samples for chemical and biological investigations' [*Indian Drugs*, 13(12) (1976), 20-24]. He also discussed his personal field experience over the past fifteen years on the problems of plant collection and identification for screening their biological actions at CDRI.

Dr Mehrotra also visited the John G. Searle Herbarium at the Field Museum of Natural History; and the Morton Arboretum and field station of the Department of Pharmacognosy and Pharmacology of the University of Illinois. He acquainted himself with the work being carried out at various departments of the university and the Animal House and other laboratories.

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Shri H.C. Jain of the Publications & Information Directorate, New Delhi, and Shri A. Joseph of the Indian National Scientific Documentation Centre, New Delhi, participated, on selection by UNIDO, in the Training Programme for Industrial Information Officers and Documentalists held at Moscow from 23 March to 1 June 1979. Organized by the All-Union Institute for Scientific and Technical Information (VINITI), the 10 week interregional training course was meant for participants from developing countries of Asia, Africa and Latin America. The training programme included topics relating to theoretical basis of informatics, organization of scientific information activity, analytico-synthetic processing of documents, system of universal decimal classification and its application, problems of mechanized information handling processes, etc. The programme also provided an opportunity for discussions and consultations on main problems of informatics. Study visits were arranged to the representative information centres and scientific and technical libraries like State Public Scientific and Technical Library, Central Institute of Information and Technico-economic Research in Instrument Making, Central Research Institute of Patent Information, State Institute for Scientific and Technical Information, Central National Agricultural Library, Information Centre—All Union Exhibition of Economic Achievements of the USSR, State Ball Bearing Plant and confectionary factory 'Bolshevik'.

The programme also included a five-day study tour to Leningrad where visits were arranged to the library of the USSR Academy of Sciences, Leningrad Inter-sectoral Centre of Scientific and Technical Information and shoe-making association 'Skorohod'.

Shri H.C. Jain was elected vice-president of the group of 25 trainees representing 17 countries.

Dr S.K. Tandon of the Industrial

Toxicology Research Centre, Lucknow, visited England on a visiting fellowship of the Wellcome Trust (UK) to work on mercury poisoning at the M.R.C. Laboratories, Carshalton, Surrey, for one year from 1 April 1978. The aim of the project was to investigate: (i) whether the regenerating kidneys possess protective mechanism against nephrotoxicity of mercury, and (ii) the effect of renal damage on the mobilization of mercury by thiol complexing agents.

The results of Dr Tandon's study indicated that the pretreatment with nephrotoxic compounds which do not induce thionein synthesis, viz. sodium chromate, *p*-aminophenol, sodium maleate or uranylacetate, gives, at least in the course of regeneration, a protection against nephrotoxicity of mercuric chloride (Hg^{203}). The urinary excretion of alkaline phosphatase, glutamic oxaloacetic transaminase and lactic dehydrogenase and light microscopic examination of renal tissue were used to characterize the effects of nephrotoxic agents on kidney.

The order of efficacy of three thiol complexing agents to remove mercury (Hg^{203}) from damaged and normal kidneys was: D-penicillamine < N-acetyl penicillamine < 2,3 dimercaptosuccinic acid (DMSA), and only DMSA increased the urinary excretion of mercury. The kidney uptake and urinary excretion of mercury were decreased in animals with damaged kidneys. In absolute value the effects of chelators on kidney contents of mercury were less in animals with renal damage than in controls but the difference was very slight if renal mercury depletion was related to the initial renal mercury contents.

A paper titled 'Decreased nephrotoxic effect of mercuric chloride on the regenerating kidneys' by L. Magos and Tandon was presented at the Spring meeting of British Pharmacological Society, Birmingham (UK) and two papers titled 'Protection against mercuric chloride by nephrotoxic agents which do not induce thionein' and 'The

effect of kidney damage on the mobilization of mercury by thiol complexing agents' co-authored by Tandon were also communicated to two journals. □

PROGRESS REPORTS

NBRI Annual Report: 1977 *

The annual report of the National Botanical Research Institute (NBRI), Lucknow, brought out recently, shows that 40 research projects were investigated during the year; of these, 36 projects were of applied nature and four of fundamental nature. Of the 40 research projects, 33 pertained to the laboratory's own research programme while the rest were sponsored or collaborative ones.

Breeding work on opium poppy (*Papaver somniferum* Linn.) for increased opium yield made a significant headway. Two early types, 'Ornamental Red' and 'Aphuri', having a flowering period of 80 and 83 days respectively, besides a number of pure lines, were isolated. A hybrid, yielding 52 kg/ha of opium on dry weight basis as compared to the yield of about 30 kg/ha by local varieties was developed, as also certain varieties bearing 12-22 capsules per plant.

Synthetic medium devised earlier for the mass propagation of *Dioscorea floribunda* Mart. & Gal. by tissue culture was simplified to the barest minimum of four ingredients, thereby making it very cheap. Culture media had also been standardized for *D. composita* Hemsl., *D. deltoidea* Wall. and *Solanum khasianum* C.B. Clarke.

Studies were made on the bract pigments of *Bougainvillea* as well as on prolongation of vase life of its flowering stems. Seed multiplication of garden Pansy cultivars, 'Swiss Giant' and 'Hiemalis', was undertaken in collaboration with the Seeds Corporation of India, New Delhi, and J.E. Ohlson Enke, Copenhagen, Denmark.

*The laboratory was earlier known as the National Botanic Gardens (NBG).

Certain dwarf types of sunflower (*Helianthus annuus* Linn.), yielding about 7 quintals/ha of seed were found fit for cultivation as 'Zaid' crop.

Studies were taken up on the effects of atmospheric pollution on epidermal and cuticular features of plants with a view to evolving biological indicators of the nature and extent of atmospheric pollution and finding out pollution-resistant plants.

In addition to continuing with the cultivation of button and paddy straw mushrooms, three species of *Pleurotus*, viz. *P. flabellatus* (Berk. & Br.) Sacc., *P. sajor-caju* (Fr.) Singer and *P. cystidiosus* Miller, were tried for cultivation under controlled conditions for the first time in Lucknow. While the first two species of *Pleurotus* have been grown elsewhere in India, *P. cystidiosus* was tried for cultivation for the first time in India at NBRI.

Various physiological disorders prevalent in the vineyards of Maharashtra State were investigated at the request of the Maharashtra State Grape Growers' Association. Studies based on the chemical analysis of leaf and soil showed that the potassium status of the vines was much below the recommended level, while the concentration of micronutrients—iron, zinc, manganese and copper—in the petioles was much higher than the sufficiency range. The symptoms such as inflorescence drying, blossom rot, cupping and curling leaves, etc. could be related to nutritional imbalance caused by excessive use of inorganic fertilizers. Overcropping was responsible for occurrence of such disorders as shot berries and partial maturity of canes. A vineyard at Nasik was found to contain high population of *Rotylenchulus reniformis*, a nematode, which could be responsible for failure of bud burst.

Investigations on the control of noxious algae by viruses was initiated recently and two seemingly new cyanophages (blue-green algal viruses), parasitizing species of *Aphanothece* and *Plectonema* were isolated from polluted habitats. Experiments showed that lysis

of algal cells in liquid cultures of mixed populations of algae and viruses became apparent within 20-40 hr of incubation and was completed within 48-56 hr. The maximum phagetiter attained in liquid lysate was 10^8 - 10^9 plaque forming units/ml. Both the viruses formed clear, circular, sharp-margined plaques on the lawn of the host, 48 hr after plating. The maximum plaque size in the case of *Aphanothece* virus varied between 1.5 and 2.0 cm while that for the *Plectonema* virus varied between 1 and 1.25 cm in diameter. Though the preliminary studies suggested the two cyanophages to be of virulent nature, tests conducted with them on axenic cultures of 20 different algal species indicated a narrow host range.

A three-day conference on Plant Tissue Culture was organized in collaboration with the Plant Tissue Culture Association (India), in February 1977. A three-day symposium on 'Production and utilization of vegetable raw materials for steroid hormones and oral contraceptives' was also organized in March 1977.

In all, 78 research papers were published; out of these, 63 research papers pertained to applied research work and 15 to the basic research work. *NBG Newsletter*, the quarterly house journal of the laboratory, started coming out in print from this year, and under the SDI service, a monthly entitled 'Current Contents in Plant Sciences' was also started. □

CSIR's EXTRAMURAL RESEARCH

Body Fat in Young Punjabi Women—A Densitometric and Anthropometric Evaluation

A quantitative knowledge of body fat, body's one of the most variable constituents, is very essential because of its diverse influence on health and longevity. It can be measured *in vivo* only by using indirect techniques. In a study carried out at Department of Anthropology of the University of

Delhi by Ms Satwanti, body fat has been determined from body density which was measured by using the water displacement technique. Since the measurement of body density involves a tedious experimental procedure, techniques have been developed for predicting body density from simple and readily accessible anthropometric measurements taken at selected sites.

The aim of the study was to build the regression equations for estimating body density, body fat, lean body mass, vital capacity and residual lung volume of young Punjabi women with reasonable accuracy so as to relieve the future workers of the tedious experimental procedure. Another purpose was to determine quantitatively different body constituents and also to study the distribution pattern of fat over the body of the subjects.

The study was conducted on 230 Punjabi women between the ages 16-32 years. All these women volunteered themselves as subjects for this investigation. The subjects were measured in the morning, 12 hours after the last meal and before they had breakfast. Field work for this study was conducted in the Defence Institute of Physiology and Allied Sciences, Delhi Cantonment.

Besides densitometry studies, each subject was measured for stature, iliacristal length, body weight, bra size, cup size, 9 diameters, 21 girths and 15 skinfold thicknesses to determine the best combination of simple body measurements to predict the body density, body fat, lean body mass, vital capacity and residual lung volume as measured experimentally.

The data were analyzed on an IBM 360/44 computer. Various correlation coefficients between body density and body measurements were calculated. Using stepwise multiple regression analysis, several regression equations were constructed with one or more anthropometric measurements which predicted body density, body fat, lean body mass, vital capacity and residual lung volume of the subjects with a fair degree of accuracy. Separate regression

equations were constructed for women belonging to different age groups.

Apart from body fat, various other components of the body like water, bone mineral and cell solids were also estimated for each subject. The pattern of fat distribution over the body of lean and obese subjects was studied. It was found that though the lean and obese women varied considerably with respect to their fat contents, fat distribution pattern was same in the two groups.

Ms Satwanti has been awarded the Ph.D. degree of the University of Delhi for her thesis based on these studies. The studies were carried out under the guidance of Prof. Indera P. Singh, Head of the Anthropology Department of the university and Dr Hari Bharadwaj, SSO-I, Defence Institute of Physiology and Allied Sciences, Delhi Cantonment. □

PERSONNEL NEWS

Appointments/Promotions

Shri D. Gupta Sarma

Shri Dharmajit Gupta Sarma of the National Geophysical Research Institute (NGRI), Hyderabad, has been appointed, on promotion, Scientist F at NGRI with effect from 4 April 1979. Shri Gupta Sarma (born 16 July 1932) had a brilliant academic career at the Calcutta University and has been a recipient of a number of awards and scholarships. He obtained M.Sc (radio physics) (1952) from the Calcutta University securing the first class first position. Shri Gupta Sarma started his research career in 1953 at the Institute of Radio Physics and Electronics, Calcutta, as a research scholar and was appointed lecturer in 1955.

Before joining NGRI in 1965, as Assistant Director, Shri Gupta Sarma served Geological Survey of India as Senior Geophysicist. At NGRI, he undertook design, development and production of a number of geophysical instruments on batch scale and contributed in the development of a strong geophysical instrumentation group.

Shri Gupta Sarma has developed indigenous instruments for airborne geophysical surveys. His attainments in the area of magnetometric and EM airborne geophysical instrumentation have led to the decision that no foreign contracts should be entered into in the area of airborne magnetometric surveys in future.

The electrical resistivity and ground electromagnetic instruments developed by Shri Gupta Sarma have been used extensively in the country by NGRI as well as by various other organizations in groundwater and minerals exploration. These instruments would otherwise have to be imported.

Shri Gupta Sarma is at present the Project Manager of a UNDP aided project entitled 'Techniques for exploration of mineral resources' at NGRI. He has offered expert consultancy services in making specialized measurements and in repairing and setting up equipment for different organizations like Geological Survey of India, Oil and Natural Gas Commission, Central Ground Water Board, etc.

Shri Gupta Sarma visited West Germany in 1969. He also visited West Germany, France, Sweden, England, USA and Canada in 1976-77 on a study tour to see the latest developments in the field of R&D in exploration geophysics. He was awarded the 1972 Krishnan Gold Medal by the IGU for his outstanding contributions in the field of geophysical instrumentation. He is a Fellow of the Indian Geophysical Union and of the Association of Exploration Geophysicists.

Shri Gupta Sarma has published a number of research papers in journals of international repute. He has a patent to his credit. He was a member of various NCST sub-committees connected with instrumentation for earth science and remote sensing.

* * *

Appointments at the National Environmental Engineering Research Institute (NEERI), Nagpur, include those of Shri S.D. Badrinath (Scientist

C, 12 April 1979) (on foreign service terms) and Shri N.S. Manthapurwar (Scientist B, 12 April 1979). Shri Kuldip Rai has been appointed, on promotion, Administrative Officer (Grade I) (6 April 1979). Shri S.M. Tamhney has been appointed Scientist B at the Jaipur Zonal Laboratory of NEERI (20 April 1979).

* * *

Shri N.R. Rajagopal has been appointed on promotion Scientist C in the Planning Division of CSIR, New Delhi (24 May 1979).

Honours

Dr M.G. Anantha Padmanabha Setty of the National Institute of Oceanography, Goa, has been elected a member of the American Association for the Advancement of Science from January 1979 in recognition of his contribution to science and particularly to geological oceanography. Earlier (Dec. 1977), he was elected a member of the International Chapter of Sigma Xi. For several years he has been a member of the Society of Economic Paleontologists and Mineralogists (USA), and the Sigma Gamma Epsilon (USA), and Fellow of the Geological Society of India and the Paleontological Society of India. □

PATENTS FILED

968/Del/78: 'Eceemark' semi-automatic electrochemical marking machine, S.K. Basu, R.C. Bishnu & B.R. Guha—CMERI, Durgapur.

969/Del/78: Improvements in or relating to pretreatment for mandrels used in electroforming of copper foils, B.A. Shenoi, S.K. Roy, V. Sivan, S. John, & N.V. Shanmugam—CECRI, Karaikudi.

973/Del/78: A process for the preparation of a haemostatic agent from *Boerhaavia diffusa* Linn. particularly to stop intra-uterine contraceptive device induced bleeding in women, K. Srivastava, G.K. Jain, R. Pal, S. Singh, J.P.S. Sarin & N.M. Khanna—CDRI, Lucknow. □

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CSIR NEWS

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CEERI Concludes Silver Jubilee Celebrations

The Central Electronics Engineering Research Institute (CEERI), Pilani, concluded its silver jubilee celebrations with a function and an exhibition at its Extension Centre in the CSIR Complex in New Delhi. The exhibition was inaugurated by the Vice President of India, Shri B.D. Jatti, at a function held at the National Physical Laboratory auditorium on 19 May 1979. In his inaugural speech, Shri Jatti complimented CEERI on the vital role it had played in fostering and developing indigenous technology during the past 25 years. He emphasized the need for rapidly transferring ideas from the laboratories to industries. Complimenting the CEERI scientists he said, "I am sure the scientists working in CEERI possess the highest kind of

patriotism as well as an exemplary sense of service, and that their endeavours will bring progress, prosperity and happiness to the people of India."

Dr P.C. Chunder, Union Minister for Education and Social Welfare, and Vice President of CSIR, in his presidential address, congratulated CEERI on its good work and hoped that the audiovisual aids being developed at the extension centre would find widespread usage in the area of educational technology particularly in adult education and for removing illiteracy.

Prof. B. Nag, Secretary, Department of Electronics, and Chairman, Electronics Commission, mentioned the projects sponsored by the Department of Electronics at CEERI. While surveying the activities of CEERI, Prof.

Nag mentioned the pioneering work of the laboratory on television, integrated circuits, electronic control systems for the Railways including a 150 kVA thyristor inverter, the scanning electron microscope, the vocoder and the synchronized slide projector system. He also emphasized the contribution of CEERI in the area of electron tubes from the point of view of self reliance in this critical area. He assured the gathering that the Department of Electronics would continue its support to the laboratory with the ultimate aim of helping the electronics industry in India.

Prof. M.G.K. Menon, Director General, Scientific & Industrial Research, in his address, mentioned that CEERI had accomplished a great deal. Most people still associated CEERI with television. While CEERI's contribution to the establishment of an indigenous television industry without foreign know-how was enormous, there were many other areas of activities in which CEERI had established a lead. These included audiovisual systems, control systems, semiconductors and microwave tubes. These areas were of very high sophistication and the products falling in these areas were of social as well as of strategic importance. CEERI was a fine example of a CSIR laboratory which had accomplished



Dr Amarjit Singh, CEERI's director, showing to Shri B.D. Jatti, Vice President of India, and Dr P.C. Chunder, Union Minister for Education and Social Welfare, and Vice President of CSIR, a prototype of a high frequency heating unit developed by CEERI and a model made with CEERI know-how

Inside

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what was expected of it when it was set up 25 years ago, Prof. Menon said.

Speaking on the occasion, Shri U. Venkateshwarlu, Managing Director, Central Electronics Ltd (CEL), Sahibabad, mentioned that CEL was receiving know-how from CEERI on a number of products such as synchronized slide projection system, microwave tubes, and 150 kVA inverter.

Prof. S. Sampath, President, I.E.T.E., stated that apart from making the activities of CEERI relevant to the needs of the country, its director had shed light on the electronics scene in India through his participation in various policy-making bodies.

Earlier, in his welcome speech, CEERI's director, Dr Amarjit Singh, mentioned that CEERI Extension Centres were active R&D units specializing in some areas of activities which needed close and constant interaction with the users. The centre at Delhi specialized in audiovisual systems,

speech communication and electronics for museums. Dr Singh paid tribute to those who had guided the laboratory in its early days and to the work of the CEERI scientists.

The exhibition held on the occasion gave a glimpse of some of the products and processes that have been developed and passed on to the industry and also of some new products which hold potential for economic impact in the future. CEERI collaborators, viz. Central Electronics Ltd, Televista, and Pal Industries, also exhibited their products. Among the exhibits were process control instrumentation for sugar industry, solar cells, induction heaters, magnetrons, television equipment, control systems for locomotives, and audiovisual systems. A multislide projection system was also demonstrated. The programme gave a bird's-eye view of the laboratory's activities and their correlation with the industry and the users. □

NPL's Test, Evaluation and Calibration Centre

The Test, Evaluation and Calibration Centre (TECC) at the National Physical Laboratory, New Delhi, is one of the four regional laboratories within the country meant for this purpose. This centre at NPL undertakes calibration of various electronic/electrical items (meters, other instruments, standard components, etc.) as per echelon II and also testing of various electronic/electrical components and equipment, and type tests. The centre has all the facilities for various environmental and endurance tests and it augments various facilities based upon specialized requirements as and when they arise. TECC at present provides both calibration and testing services to various public and private undertakings, Defence and other government departments and laboratories, and several other organizations including various state test and development centres.

The Department of Electronics, in order to promote consciousness towards standardization, testing and

quality control (STQC Programme), funds this centre for procurement of additional capital equipment. As an integrated approach towards standardization, testing and quality control, the Department of Electronics has also funded various state electronic corporations for equipping the test and development centres in different states. These centres would carry out calibration work as per echelon III and testing of components generally not requiring costly equipment as presently available in TECC.

In the past, NPL's TECC tested various electrical and electronic items such as fluorescent tubes, bulbs, chokes, starters, capacitors, resistors, relays, voltage stabilizers, different types of light fixtures, and various electrical appliances such as plugs, sockets, switches, cables and fans as per the relevant IS specifications. Test certificates are accordingly issued to the respective manufacturers, and wherever items have not performed satisfactorily,

scientists at this centre have recommended to the respective manufacturers steps to improve the quality of their products. In various instances these recommendations have been helpful to the manufacturers. Moreover, in several instances, based upon results of tests at this centre, these manufacturers have been granted ISI certification which helps in their sales promotion. In several cases, this has also resulted in finalization of DGS&D rate contract purchases.

The centre has been in operation for some time and is presently building up data bank with regard to quality and performance of different electronic/electrical items available from different suppliers. The centre hopes to recommend, in course of time, the names of established suppliers to the CSIR laboratories for their requirements of various items of established quality. For the time being, the laboratories have been requested to insist on the indigenous suppliers that the items be type tested at TECC (or at any other regional laboratory) as per relevant specifications. In case the items have not already been tested, TECC offers to test the items. (Wherever IS specifications have not been finalized, testing can be carried out as per mutually agreed specifications). It is expected that by following this procedure the CSIR family can play an important role in generating more awareness about the importance of quality and thereby leading to improvement of product quality which is vital for our national development.

TECC has recently brought out a brochure giving details of its testing facilities. For copies of the brochure and for other details regarding the centre and its services one may contact the Scientist in charge, TECC, NPL, Hillside Road, New Delhi 110012. □

World Environment Day: CSMCRI

To celebrate the World Environment Day (5 June 1979) the Central Salt and

Marine Chemicals Research Institute (CSMCRI), Bhavnagar, organized a seminar on 'Man and environment'. The seminar was presided over by Prof. R.S. Trivedi, Vice Chancellor of the Bhavnagar University. Experts in various areas spoke, on invitation, on environment and pollution.

Prof. Trivedi, in his presidential address, mentioned about the complex relationship of man with the environment. Giving reference to Malthus' theory, he explained the magnitude of controlling pollution in view of the increasing population. □

Nickel Toxicity and Chelation Therapy

Shri A.K. Mathur of the Industrial Toxicology Research Centre, Lucknow, carried out experiments on the effect of prolonged exposure to nickel which produces enzymatic and morphological changes in certain vital organs, the histological lesions being directly related to the duration of exposure. The rate of nickel accumulation was found to be highest in myocardium followed by kidneys, bone and other tissues, and the metal uptake by the tissues and the sub-cellular fractions of myocardium was regulated by the dose and the duration of the exposure. The survey at electroplating/polishing and paint/pigment industries, where salts of nickel and chromium are used, revealed an increased urinary excretion of the two metals. The urinary level was found to be a reliable index of nickel and chromium exposure. The studies on the mobilization of nickel from the poisoned animals indicated that 1,2-cyclohexylene dinitrilotetracetic acid (CDTA), diethylenetriamine pentacetic acid (DTPA), nitrilotriacetic acid (NTA), sodium diethyldithiocarbamate (DDC) and triethylene tetramine (TETA) might be useful in the prevention/therapy of the nickel poisoning. The complexes of nickel with these and some other chelating agents were prepared under physiological conditions, characterized by physical

measurements and their structure investigated through infrared spectroscopy.

For his thesis based on these studies, Shri Mathur was awarded Ph.D. degree (1979) of the Lucknow University. He carried out the studies under the supervision of Dr S.K. Tandon of the laboratory. □

Deputation Briefs

Dr P. Saha of the Central Glass and Ceramic Research Institute, Calcutta, visited a number of research laboratories in USA from 3 April to 19 May 1979 on deputation on National Science Foundation-CSIR Exchange of Scientists Programme to familiarize himself with the latest trends of research in materials science. Dr Saha visited the State University College at Brockport; Materials Research Laboratory (MRL), Pennsylvania State University, Cincinnati, Sawyer Research products Inc., Eastlake; Materials Science Division of Case Western Reserve University, Cleveland; Department of Geological Sciences, University of Washington, Seattle; International Business Machines Inc. (IBM), New Jersey; and Bell Laboratories, New Jersey.

During his visit he attended the 1979 annual meetings of the American Ceramic Society held at Cincinnati as the representative of the President of the Indian Ceramic Society. He also delivered invited lectures at MRL, Materials Science Division of the Case Western Reserve University, and Department of Geological Sciences of the University of Washington. □

Conference Briefs

Dr A.R. Verma, Director, National Physical Laboratory, New Delhi, visited Korea from 12 to 23 May 1979 as leader of the Indian delegation to the ASCA (Association for Science Cooperation in Asia) Conference. Dr Verma attended the pre-seminar on 'Standardization for industrial development' held at the science town, Daeduk (Korea), during 14-16 May 1979 and presented a paper

titled 'A proposed national measurement system for India'. He presided over the second session of the seminar on 15 May.

The main ASCA Conference was held at Seoul during 17-19 May 1979. Dr Verma delivered a talk giving highlights of the scientific and technological developments in India. A country report titled 'Status of Science and Technology in India: 1978' prepared by the Publications and Information Directorate of CSIR was circulated among the participants.

Dr Verma was given the honour and responsibility of presenting to the main ASCA Conference the conclusions and recommendations of the seminar on 'Standardization for industrial development' on behalf of all the participating countries. A joint communique was issued after the conference.

The important decision of this conference on metrology concerns the formation of a Regional Measurement Systems Centre for standardization, measurement and quality control. This centre will take up, among other activities, the work of intercomparison of standards. To begin with, this will be done for temperature standards which will be coordinated by Mr T.P. Jones of Australia. Bringing out an ASCA Directory listing facilities, equipment and personnel will be another important activity. Exchange of information and scientific personnel, giving training and holding of periodic meetings will also be done by this centre for which Korea has volunteered to do the initial work.

At the end of the conference there was a tour to the steel mill at Pohang and the ship-building yard at Posan. The production of 6-8 million tonnes of steel with imported iron ore and coal in a steel mill which was started in 1968 is an outstanding achievement of Korea. The Hyundai Ship-building Yard, started only seven years back in 1972, is today one of the biggest ship-building yards with big dry-dock facilities and production figures, each of which set an unparalleled record for the world.

* * *

Dr T.N. Khoshoo, Director, National Botanical Research Institute, Lucknow, visited New Zealand, on deputation, from 4 to 16 February 1979 to attend the symposium on 'Reproduction in flowering plants' held at Christchurch. He also visited a number of research centres to acquaint himself with the current developments in plant science research.

The symposium discussed the nature of evolution and extent of manipulation possible in reproductive systems in flowering plants. The various topics discussed were pollination biology including morphology, ecology, cytology, ultrastructure, genetics, physiology and evolution of outbreeding and inbreeding systems; pollen physiology; embryology; development and ecology of seeds; apomixis and other forms of asexual reproduction; artificial manipulation of natural breeding systems with particular reference to the development of new techniques for speedier and more efficient plant breeding.

The symposium was spread over five days of plenary and concurrent sessions from 5 to 10 February 1979 with a day's break (on 7 February) for a tour to familiarize the delegates with the New Zealand vegetation. More than 133 delegates from 17 countries, viz. Australia, Belgium, Canada, Denmark, France, India, Israel, Japan, Malaysia, New Zealand, Nigeria, Switzerland, UK, USA, USSR, West Germany and Zambia, attended the symposium.

The symposium was supported by the Royal Society of New Zealand, the International Union of Biological Sciences, the Commonwealth Foundation and Qantas Airways Ltd.

Inaugurating the symposium Mr W.F. Birch, New Zealand Minister of Science and Technology, said that this was the first conference on plant sciences held in New Zealand and would give botanists and geneticists of New Zealand an opportunity to exchange information with their counterparts from other countries. He said that his government had set up an Advisory Committee on Novel Genetic

Engineering so as to ensure that the work was carried out without risk to human health. He emphasized that his government realized that advancement in all plant-based industries like agriculture, horticulture, forestry, etc. would not be possible without geneticists and the genetic engineers, as they have a key role in adapting and improving plants which provide basic resource as also items for export from New Zealand. According to him, the most fascinating case was the growth in Kiwi fruit (*Actidinia chinensis*) production. Although the plant was introduced about 50 years ago, work was initiated seriously in mid-1960s and the Export Promotion Committee identified in 1969 the possibilities to increase export by 500% between 1970 and 1976. Nearly two million trays of this fruit (valued at NZ \$ 10 million) were exported during the last year and the prospect is to take it to 5 million trays in 1980s. The export is expected to reach NZ \$ 15 million in 1979 and by 1984 to NZ \$ 45 million. Similar progress is envisaged in blue berries (introduced in 1970) and other fruits as also steroids for female contraceptive pill from *Solanum aviculare*, at present a weed. New Zealand is also planting thousands of hectares of exotic forests annually for timber, paper and cellulose polymers. Satisfactory progress has been achieved with methanol in liquid fuels area. All attempts were being made to keep New Zealand's air, water and soil clean and here also plants had a very important role to play, the minister said.

The symposium paid importance to the knowledge of breeding systems for better understanding of evolutionary dynamics of plants so as to help in standardizing breeding methodologies for improving plants and for making meaningful plans for plant introduction and conservation. All these aspects are most relevant to subtropical/tropical areas which, besides being the repository of the largest diversity of plant wealth, are the centres of origin/diversity of many of the economic plants. In order to arouse the interest of

the students, teachers and researchers in botany/genetics in these areas, it was felt that the symposium should be made a regular feature and the next one should be held in a tropical/subtropical country such as India.

Some of the most important papers discussed were in the following areas: Breeding systems of tropical hardwood trees of New World; Parasexual reproduction; Breeding strategies; Overcoming incompatibility and promoting genetic recombination; Modification of breeding systems in plants under domestication; Biology of heterostyly; Mammal and bird pollination; and Starch in angiosperm pollen grains and its anthecological significance. Apart from these, there were a number of papers on topics covering morphological, embryological, biochemical, genetical, biometrical and ultrastructural aspects with both basic and applied objectives in view.

* * *

Dr Harsh K. Gupta of the National Geophysical Research Institute (NGRI), Hyderabad, participated in the international symposium on 'Earthquake prediction' organized at Paris by Unesco during 2-6 April 1979.

The symposium was organized (i) to review the present state of progress in understanding earthquake processes and in the use of precursory phenomena to predict earthquakes, and (ii) to assess the practical implications of such predictions for mitigating earthquake hazards, specially in the light of their social response and economic impact under different conditions. The symposium was held in the following seven thematic sessions: Earthquake precursors; Physical processes, experiment and theory; Methods of earthquake prediction; Individual and group response; Economics of earthquake prediction; Role of institutions; and Communication of predictions and warnings.

Dr Gupta presented a paper entitled 'Earthquake prediction research in Assam, north-east India'. In his paper,

Dr Gupta observed that the north-east India region might be undergoing a precursory dilatancy stage. Several other scientific deductions indicated that Assam region was due for a big earthquake. This constituted a long-term prediction in earthquake prediction parlance.

The symposium was followed by discussions on the scientific, social and economic aspects of earthquake prediction by a panel of experts. Dr Gupta took part in the panel discussion as a consultant. The panel discussions were aimed at making suggestions regarding future course of action to be taken by Unesco in earthquake prediction considering the present state of knowledge. During discussion it emerged that at least the following seven earthquakes were correctly predicted:

Place	Date	Magnitude
<i>China</i>		
Haicheng	3 Feb. 1975	7.3
Songpan-Pingwu	16 Aug. 1976	7.2
Lungling	29 May 1976	7.6
Yen Yung	7 Nov. 1976	6.8
<i>USSR</i>		
Dushanbe	5 Nov. 1976	5.2
Border region, Iran-USSR	16 Sept. 1976	7.7
Pamir	1 Nov. 1976	7

During his stay at Paris, Dr Gupta also had useful discussions with Dr Frances Delany and Prof. Bordet in connection with the investigations under the Geodynamics Project in Himalayan region and matters relating to Inter-Union Commission on Geodynamics (Working Group 6). □

PROGRESS REPORTS

RRL-Jorhat Annual Report: 1977

The annual report of the Regional Research Laboratory (RRL), Jorhat, published recently reveals that the laboratory started inter-institutional

and inter-laboratory collaboration on a number of projects. Eight processes were released to 20 parties through the National Research Development Corporation of India (NRDC). Based on the know-how and planting materials supplied by the laboratory, a number of parties started commercial production of citronella; as a result, the total area under citronella cultivation in the north-eastern India came up to 6000 acres.

A new technique of constructing low cost houses with bamboo, secondary timber and cement mortar was developed. In this technique, pre-treated split bamboo matting is fixed with the timber framework in wall and roof and plastered. The technique is simple and houses constructed are cheap, structurally safe, durable and they provide reasonable comfort. The bamboocrete shell roof also gives a very modern and pleasing look to the house.

A formulation and a paint were developed to make thatch fire-resistant. The approximate cost for such treatment is estimated at Rs 2 per m². Experiments to ascertain weathering effect are in progress.

R&D work for separation of speciality boards from paper wastes, in collaboration with the Central Building Research Institute, Roorkee, was in progress. A few experimental houses have been constructed inside the laboratory campus to observe weathering and comfort conditions. This process has recently been licensed to two parties for commercial exploitation; one of these parties is from Philippines. The boards made by this process are fireproof, water resistant, light-weight, durable and they possess high strength. The boards are suitable for making low-cost houses.

Investigations were carried out to work out a process for the production of heat stable amylases active in temperature range 85-90°C. Several hundreds of thermophilic bacteria were scanned and a strain designated as R-3 produced enzyme active at 80-90°C. As the yield of enzyme obtained from this strain was very low, it was mutated. The mutated

strain produced 1.5 times more enzyme than its parent, but was susceptible to phage. Two other strains designated as A004 and IAN002 produced amylase active at temperature 78-80°C. Study on cultural conditions for the optimum production of enzymes and characterization of the enzymes obtained from strain A004 were made.

Work aiming at development of microbial process for production of fat, fatty acids and related products was continued. Studies on strain improvement through mutations were carried out with 3 fat accumulating species, viz. *Endomycopsis lipolytica*, *Endomices vernalis* and *Lipomices starkeyi*.

The laboratory took up the development of a geomicrobiological method for prospecting of secondary recovery of petroleum in the petroliferous areas of Assam in collaboration with the Oil India Ltd, Duliajan, and Assam Oil Company, Digboi. One hundred and fifty-eight sub-soil samples covering 1500 km² were collected from the Digboi and Duliajan-Naharkatia oil fields for the study. In Digboi oil fields where petroleum deposits are known to occur, 100% correlation was obtained by microbial activity of oil reserves. In the Duliajan-Naharkatia area where oil is present in deep structures, a high correlation of up to 90% could be obtained.

The know-how for production of carbon black from Assam coal developed earlier was licensed to Union Carbon Black Ltd (UCBL), Gauhati. The process was demonstrated to the licensee and a considerable amount of carbon black was produced for market study. Attempts were made to improve recovery of the product by incorporation of a filter bag unit.

A process for desulphurization of high sulphur fuel oil was worked out in laboratory scale (3 litres/hr) and assigned to NRDC for releasing for exploitation. Scale-up work on the project would be taken up on sponsorship basis.

A crusher-cum-juice expeller for fibrous vegetable matters was designed

and a model of 25 kg/hr capacity was fabricated. The machine was used for extraction of pineapple juice and was found to extract about 80% juice.

To obtain fats, fatty alcohols and sterols and various sterol based products from sugarcane pressmud, a modified process has been worked out wherein the bagasse from the pressmud is separated, prior to extraction, with a suitable solvent to obtain the wax. It has been found that up to 1/3 of the total wax present in the sugarcane could be extracted by simple method such as scrubbing with cotton moistened with dilute soap and rice hull ash. Several strains of bacteria have been isolated which could utilize and metabolize sugarcane sterols like sito-sterols and stigma-sterols. Some of these bacteria could be identified at genus level. The methodology to estimate the intermediate metabolites has been worked out.

A know-how package on phosphamidon based on extensive pilot plant investigations was prepared. The process was successfully demonstrated on pilot plant scale to the representative of Sudarshan Chemical Industries, Pune.

A laboratory fluidized bed combustion unit capable of burning 20 kg/hr of coal was designed, fabricated and operated. The work was completed with Assam coals from Borgolai and Tipong collieries of Makum coalfields. Operating conditions such as temperature, lime-to-coal ratio, fluidizing velocities for efficient combustion and pollution control were established. Loss of unburnt coal and lime in the carry-over was established, regeneration of lime and activity of limestone were studied.

Studies on the seismicity and the geodynamic evolution of the north-eastern region of India were continued.

The relative merits and demerits of the process for manufacture of aluminium sulphate from clay vis-a-vis bauxite were examined. High alumina clay as a raw material was adjudged advantageous, as by using this material sodium or potassium silicates could be

produced as byproducts besides aluminium sulphate. The preliminary techno-economic feasibility of the process was worked out. Scale-up work was in progress.

Process for making a number of dispersant chemicals using various types of raw materials was developed on the laboratory scale.

Work aiming at the development of process know-how for sodium silicate and cement-like products from the active silica present in paddy husk was in progress.

A high yielding improved strain of *Solanum khasianum* designated as JRL-30 was found out. This variety was less susceptible to wilt disease and yielded more than 6 tonnes of berries per hectare with solasodine content not less than 3%. This variety has been released to a number of parties for commercial cultivation.

The multiplication of a newly evolved strain RRL-JOR-3-1970 was continued. This strain was found to be superior and had potential of yielding higher than the Jorhat and Bangalore strains. This strain would be released for commercial exploitation shortly.

Investigations for development of know-how for quinalphos, another important organophosphorus pesticide, was taken up on multi-client sponsorship basis, in collaboration with RRL-Hyderabad.

Exploratory studies on the various intermediates required for manufacture of yet another organophosphorus pesticide, chlorfenvinphos, were completed. The method of preparation of 2,2,2',4'-tetrachloroacetophenone, the most crucial intermediate in the process, was standardized in the laboratory. Level-I work (1 kg/batch) was completed and level-II (pilot plant) work was in progress.

The laboratory has developed a technique for NCR paper. The technique consists of reaction between two coated surfaces, one of which acts as a donor or transferer and the other acts as a receiver or acceptor surface. The process has been developed on labo-

ratory scale and several trial runs in the production coating machines have been taken successfully.

A water-resistant glue was formulated for making water-resistant corrugated boards. Different treatments carried out showed considerable increase in the strength of the boards. Further work was in progress.

Twenty-six papers were published and nine patents were filed during the year. □

CSIR'S EXTRAMURAL RESEARCH

Enzyme Activity Levels in the Tissues of *Rana hexadactyla*

Shri C. Sree Ramulu Chetty, a CSIR junior research fellow working at the Department of Zoology, S.V.U. College, Tirupati, under the guidance of Dr K.S. Swami, Professor and Head of the Department, took up for investigation the molecular mechanisms relating to the production, utilization and disposal of ammonia in selected tissues, viz. liver, kidney, brain and muscle, of frog, *Rana hexadactyla* Lesson.

Healthy *Rana hexadactyla* Lesson of similar size and weight were selected for the investigation. Sciatic denervation was unilaterally done under aseptic conditions and the operated frogs were maintained in aquarium tanks without crowding and with regular feeding, for a period of one month. Corresponding batches of control frogs, which are not subjected to denervation, were also maintained in glass aquarium under similar conditions. Three doses of ammonium lactate were selected and administered intraperitoneally (after due standardization) to both the normal and denervated frogs for seven days and these were considered as normal and denervated experimental animals. The control animals received sodium lactate of the same dose. The frogs were sacrificed by double pithing and the selected tissues were expeditiously excised for experimental studies. Since,

selected tissues showed remarkable derangement in the metabolism, some biochemical investigations were carried out during both the denervation and induced ammonia stress.

Important among the observations were:

1. An elevation in the activity level of AMP deaminase was found in the denervated muscle as compared to the contralateral muscle, which indicated that the increase in the levels of ammonia in the denervated muscle is not only due to the enhanced deamination of free amino acids but also due to the elevated activity of this enzyme which deaminates AMP to ammonia and IMP. The K_M (Michaelis constant), V_{max} (maximal velocity), slope, intercept, and K_i (inhibitor constant) were calculated in both the contralateral and denervated muscles. The ionizable groups were identified by determining K_M at different pH values. The pH and the thermal dependency of AMP deaminase and the activation energies were also studied.

2. The activity levels of AMP deaminase and arginase were studied in the selected tissues of normal and denervated frogs exposed to ammonia stress. In general, the activity levels were found to increase with increase in dosage in all the tissues but the extent of increase was found to be more in the tissues of denervated frogs.

3. The glutamate dehydrogenase activity levels in liver were found to be parallel to the dosage of ammonia in both normal and denervated frogs with ammonia stress but in kidney and brain the activity levels were decreased.

4. The catalase (peroxidase) showed some degree of variance in the activity levels to differential concentrations of ammonia. The activity showed marked drop at low and moderate doses, while at sublethal dose the activity has come to normal level in all the tissues of both normal and denervated frogs.

5. An increase in glutamine, urea and ammonia levels was found in all tissues and blood of normal and denervated frogs during ammonia stress. The

magnitude of increment was found to be more in the denervated animals.

6. The DNA level was found to increase at low dose and thereafter the levels dropped below the control level in liver and kidney. In general the DNA content was found to increase in brain and decrease in muscle. The RNA levels showed comprehensive decrease in all the tissues in proportion to ammonia dosage.

7. An increase in the activity levels of aldolase and MgATPase and decrease in the activity levels of malate dehydrogenase (except in brain and muscle) were noticed in all tissues during ammonia stress.

8. Significant increase in the activity levels of acetylcholine esterase and pronounced decrease in acetylcholine content were found in all tissues of normal and denervated frogs during ammonia stress.

All these aspects were studied in relation to denervation and induced ammonia stress (in both normal and denervated frogs).

Shri Chetty has submitted his thesis based on these studies for the Ph.D. degree of Sri Venkateswara University, Tirupati. □

PERSONNEL NEWS

Honours and Awards

Prof. A. Rahman

Prof. A. Rahman, Chief (Planning), and Head, Centre for the Study of Science, Technology and Development, CSIR, has been elected President of the International Council for Science Policy Studies (ICSPPS) at its sixth conference held at Oslo. The earlier President of the Council were: Dr. Derek J. de Solla Price, Avalon Professor of History of Science, Yale University, USA, and Dr Jean-Jacques Salomon, Head, SciencePolicy studies, Organisation for Economic Cooperation and Development, Paris.



This rare honour conferred on Prof. Rahman is in recognition of the contribution of India in general and that of Prof. Rahman in particular, constituting a distinctive point of view in the field of science policy studies.

ICSPPS is a section of the International Union for the History and Philosophy of Science of the International Council of Scientific Unions. □

PATENTS INFORMATION

Indian Pat. 1463/Cal/76*

A sulphate recycle process for the preparation of NP fertilizers from Indian rock phosphate

S.R. PADALKAR, C.S. DORAI & V. DAMODARAN
National Chemical Laboratory, Pune

A novel and innovative process has been developed at the National Chemical Laboratory (NCL), Pune, for the manufacture of NP fertilizers without the use of sulphuric acid.

The NCL process consists in treating rock phosphate (34% P_2O_5 and above) with a strong solution of ammonium bisulphate containing enough nitric acid to complete the solubilization of the P_2O_5 in the rock. The reaction is carried out at carefully controlled conditions using good quality gypsum crystals as seeds. Filtration of the reaction product gives a filter cake of gypsum with little P_2O_5 contamination and a strong solution of ammonium phosphate-nitrate. The solution is neutralized with ammonia, evaporated and granulated to get a free flowing 24:24 or 20:20 fertilizer.

The reaction between NP gypsum and ammonium carbonate yields ammonium sulphate and calcium carbonate. The ammonium sulphate is thermally decomposed to yield the ammonium bisulphate required for the above reaction with the rock phosphate. Thus the sulphate values are recycled in the process which is found to work very well with beneficiated Indian rock phosphate.

*Accepted.

At present the phosphoric acid production in the country, based on imported sulphur, consumes more than half a million tonnes of imported sulphur annually. The nitrophosphate processes which do not use sulphuric acid are not able to produce completely water soluble phosphate fertilizers. Moreover, these processes produce unbalanced N : P₂O₅ ratios.

The N:P ratio of the fertilizer produced by the NCL process is 1:1 and the phosphate content of the fertilizer is completely soluble in water. It is

estimated that if the present phosphate units adopt the NCL process the annual savings in foreign exchange would be at least Rs 10 crore. □

PATENTS FILED

489/Del/78: A process for the preparation of yellow to violet azo disperse dyes from 2-hydroxy-3-naphthoic acid and alkylamides and their 6-sulpho alkylamide derivatives for the application to polyester cotton blends, N.R. Ayyangar, B.V. Bapat & B.D. Tilak—NCL, Pune.

223/Del/79: Improvements in or relating to the automatic knitting machines, H. Singh & R. Singh—MERADO, Ludhiana.

241/Del/79: Process for the production of *o*-cresol and 2,6-xyleneol, M. Janardana Rao, G.S. Salvapati, M. Ehsan & R. Vaidyeswaran—RRL, Hyderabad.

242/Del/79: Process for electrochemical preparation of phenylethylamine using iron black cathode, H.V.K. Udupa, V. Krishnan & A. Muthukumaran—CECRI, Karaikudi. □

Obituary

Prof. M. S. Thacker

We record with deep regret the passing away of Prof. Manaklal Sankalchand Thacker, former Director General, Scientific and Industrial Research. Prof. Thacker, 75, died of a heart attack at Bombay on 6 July 1979.



Prof. M.S. Thacker

Prof. Thacker (born 3 Dec. 1904) received his early education in Ahmedabad and Bombay, and proceeded to Europe at an early age. He graduated in Engineering from the Bristol University and undertook post-graduate research in the Department of Electrical Engineering of that university. Later, he joined the Bristol Corporation Electricity Department as an engineer. He returned to India in May 1931 and joined the Calcutta Electric Corporation, Calcutta. He continued

there till 1947, when he was invited to take up the professorship of the newly created Department of Power Engineering at the Indian Institute of Science, Bangalore. In 1949, he was appointed Director of the institute.

In the progress of the Indian Institute of Science, Bangalore, Prof. Thacker provided many-sided leadership. He made significant contributions in electrical engineering, notably in the design and development of new instruments for use in power supply systems. His contributions brought him numerous distinctions from learned and professional bodies, within and outside the country. He was the first Indian Fellow of the American Institute of Electrical Engineers.

Prof. Thacker authored numerous papers and memoirs in power technology and high voltage engineering. He participated in a number of international conferences and committees. He was the chairman of the Indian National Committee of the International Conference on Large Electricity Systems, member of the National Committee of the World Power Conference and member of the Electro-technical Commission. He led the Indian delegation to the World Power Conference held at Rio de Janeiro (Brazil) in 1954.

Prof. Thacker was intimately associated with many scientific and technical organizations in India. He was a member of the Council of the Indian Science Congress Association and of the

National Institute of Sciences; member, National Advisory Committee on Telecommunication; member, Development Council for Electrical Industries; etc.

Prof. Thacker took over as Director General of the Council of Scientific and Industrial Research on 3 August 1955. Prof. S.S. Bhatnagar's work of setting up a chain of national laboratories in the country was continued by Prof. Thacker and as many as 14 laboratories—including the Regional Research Laboratories at Hyderabad, Jorhat and Jammu, the National Geophysical Research Institute at Hyderabad, and the National Aeronautical Laboratory at Bangalore—were established/taken over during his tenure. He laid down his office on 1 August 1962.

Prof. Thacker was a member of the Planning Commission (1962-65).

Prof. Thacker was the leader of the Indian delegation to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas (Geneva, 1963). As a follow up of this conference, an Advisory Committee for the Application of Science and Technology for Development was set up by UN's Economic and Social Council (ECOSOC) and Prof. Thacker was elected its chairman.

Prof. Thacker was awarded Padma Bhushan in 1955.

Condolence meetings were held on 7 July 1979 at CSIR Headquarters and the constituent laboratories at which rich tributes were paid to Prof. Thacker. □

CSIR NEWS

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Indo-USSR Collaboration in Solar Energy Utilization

An Indian delegation visited USSR during 29 June-13 July 1979 in connection with the Indo-USSR collaboration in solar energy utilization. The delegation was led by Dr D.J. Mehta, Director, Central Salt and Marine Chemicals Research Institute (CSMCRI), Bhavnagar. Other members of the delegation were Dr V.G. Bhide of the National Physical Laboratory, New Delhi, and Dr K.S. Rao of CSMCRI. The team visited solar hot water, space heating and solar water pump installations in the Crimean and Uzbek regions. They also visited the solar energy laboratories of the Institute of Physical Studies of Uzbek Academy of Sciences, Tashkent, and Kryzhizhanovsky Power Engineering Institute (ENIN), Moscow.

A two day seminar on Solar Energy Utilization was held at ENIN, Moscow, on 10 and 11 July 1979. Ten papers, six from India and four from USSR, were presented. The Soviet specialists appreciated the work being carried out in India. The Indian team discussed the Indo-USSR collaborative research projects relating to solar energy utilization with Dr Konstantinovskiy, Director General, 'Krymteplotset' Simferopol, Dr Umarov, Head of Solar Physics Department, Uzbek Academy of Sciences, Tashkent, and Dr Malevsky, Head of the Solar Energy Laboratory, ENIN, Moscow, and finalized the time-bound programme indicating clearly the responsibility assigned to each side on the following three projects: (1) Development and testing of selective surfaces and

collectors; (2) Development of solar thermoelectric generator; and (3) Development of autonomous power station using stirling engine.

The collaborating institutions are Kryzhizhanovsky Power Engineering Institute, Moscow; Institute of Physical Studies, Uzbek Academy of Sciences, Tashkent; and Central Salt and Marine Chemicals Research Institute, Bhavnagar; and National Physical Laboratory, New Delhi.

A protocol on the INDO-USSR collaboration regarding the above three projects was signed by Dr V.I. Savin, Senior Engineer, Main Administration for Design, Patent and Research Work, the USSR Ministry of Power and Electrification, on behalf of the USSR, and Dr D.J. Mehta, Director, CSMCRI, Bhavnagar, on behalf of India. □

Trisodium Phosphate for Chemical Phosphating

The Central Electrochemical Research Institute (CECRI), Karaikudi, has developed a chemical phosphating process which uses trisodium phosphate, a cheap commercially available material. Phosphating improves the adhesion of paint to steel base and thus improves its corrosion resistance.

At present the demand for the phosphating solution is valued at Rs 10 million and it is expected to be doubled in the next 5 years.

The CECRI process consists in incorporating heavy metal phosphate and an accelerator in acidified sodium phosphate solution in measured quantities and using it for phosphating ferrous items.

Capital investment for a plant of capacity 500 m²/day is Rs 2.88 lakh and the cost of phosphating works out to be Re 0.80/m².

Inhibitor Formulation for Cooling Water CECRI has developed a formulation which when added to cooling water can inhibit the corrosion of the cooling system.

Suitable inhibitors have to be added to cooling waters for controlling corrosion in industrial cooling systems. At present the demand for inhibitor is being met partly by imports and partly by indigenous production based on foreign know-how. The estimated demand for such inhibitors is valued at Rs 10 million.

The capital investment for a plant of capacity 30 tonnes/annum is Rs 7 lakh, the cost of production being Rs 6/kg. The return on investment is expected to be 49%. □

Sterilant Activity of *Vinca rosea* Alkaloids

Vinca rosea (Apocynaceae) has gained considerable importance in medicine since the discovery of the anticancer properties of its alkaloids. The capability of arresting mitosis by antitumour alkaloids may be directed to work as insect control agents. The anticancer activity of *Vinca* has given a pointer for further exploration of *Vinca*

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alkaloids as insect chemosterilants. With this idea in view Dr (Mrs) Kumudā Sukumar and Dr (Mrs) Z. Osmani initiated work on *Vinca* alkaloids at the Regional Research Laboratory, Hyderabad.

The total leaf alkaloids and the total root alkaloids were used against *Dysdercus cingulatus*, an insect pest of cotton, commonly known as the red cotton bug. The results indicated that the leaf alkaloids were superior to root alkaloids in sterilizing activity. As with other alkylating chemosterilants, males were sterilized with a lesser dose. At 1 %

level the leaf alkaloids showed significant sterility. At 2 % level toxicity predominated sterility.

One noticeable factor with the alkaloid-treated cotton bugs was the effect on pigmentation. The wings of the treated insects showed dominant black patches. The genitalia of the males had abnormal extrusions after treatment.

Experiments with *Aehoea janata*, a very serious defoliating pest on castor, have also shown positive response for sterilitant activity, when treated with *Vinca* alkaloids. Further study is in progress. □

FILLER WIRES FOR ALUMINIUM ALLOY WELDING

NML's WORK*

Sound and defect-free welding of high-strength aluminium alloys with the welded region possessing adequate mechanical and physical properties comparable with those of the parent metal is an important aspect of the technology of fabrication of aluminium alloys for construction and this is achieved through the use of filler wires of specified compositions.

The properties generally required in the welded regions of aluminium alloys are: (i) the welded joint or fusion zone should be free from cracks, and (ii) the strength (28 kg/mm²), corrosion, and other properties of the weld metal should match those of the parent metal. The properties of the weld metal are mainly governed by the chemical composition of that region which in turn is controlled by the composition of the parent metal, filler wire and the proportion of the wire in the weld metal.

The nominal composition of most grades of these filler wires is described in the various national standards, but their production technologies need to be developed to suit the indigenous resources. Developmental work was, therefore, initiated at the National Metallurgical Laboratory (NML),

*Scientists associated with this project at NML are: Dr Rajendra Kumar, Shri B.K. Saxena and Shri G.D. Sani.

NML-PM7 welding filler wires for aluminium alloy welding, was developed and the performance of these filler wires was evaluated at the Hindustan Aeronautics Ltd (HAL), Bangalore. Industrial trials of these products confirmed their suitability for welding high-strength aluminium alloys.

NML has since been producing these filler wires to meet the requirements of HAL.

Scope

NML-PM6/NML-PM7 welding filler wires find wide application in various civil and defence establishments where high/medium strength aluminium alloys are in use.

NML-PM6 filler wires find applications in welding of sheet metal components, welding of sheet to tube joints, welding of forged machined blades and casting assemblies, and in weld corrections of castings.

Some of the typical applications of NML-PM7 filler wires are in the repair of sealing ring/sealing face for wear/fretage by weld build of material



Samples of NML-PM6 welding filler metal at various processing stages—from cast billets (right) to final coils of filler wires

and machine to restore drawing requirements; repair of broken bolt lug by welding; reclamation of fretted flanges by weld build of material and machine to size; repair of worn bearing abutment face when fretted by welding and machining to restore drawing dimensions; repair of diffuser back plate outer/inner rim location by welding and machining to standard dimensions; and repair of cracks on castings. □

PROGRESS REPORTS

RRL-Hyderabad Annual Report: 1977-78

The annual report of the Regional Research Laboratory (RRL), Hyderabad, for 1977-78, published recently, shows that the laboratory continued to lay emphasis on applied research and development for the chemical industry. A major structural change during the period was the establishment of a semi-autonomous Centre for Cellular and Molecular Biology at the laboratory with the Biochemistry Division of the laboratory forming the nucleus of the centre. The laboratory paid special attention to assignments sponsored by government, industry and other agencies. The following new assignments were taken up : process development of new anticholesterol and anti-inflammatory compounds, scribe coatings and peel coatings, preparation of feasibility reports on crystalline papain and papain concentrate, fatty acid complex, glyoxal and BHC. The assignments that were completed include: mathematical modelling of the synthetic section of ammonia plant, feasibility report on coal gasification plant in Andhra Pradesh, feasibility report on papain concentrate and crystalline papain, and clinkering of minerals.

Laboratory-scale work on monocrotophos, an important organophosphorus insecticide with very high activity towards aphids, mites and worms, was completed, including the recycling studies of chloral-toluene mixture for the preparation of chloral adduct and

for the dissociation experiments. Pilot plant experiments were carried out for optimization of conditions. Samples of formulated monocrotophos were sent to an agricultural organization for field trials.

A new process has been developed for the synthesis of 1,2-dihydro-2-oxo(1H)-quinoxaline—a key intermediate for the synthesis of a broad spectrum pesticide, quinalphos—starting from sodium salt of monochloroacetic acid and *o*-phenylenediamine. Conversion of 1,2-dihydro-2-oxo-(1H)-quinoxaline into a stable technical-grade quinalphos has been achieved. The total process was optimized in the laboratory and scaled up to 4-5 kg of quinalphos per batch.

Trimethyl phosphite, a raw material for the production of a number of farm chemicals, is at present produced only by one firm. There is a good scope for large-scale production of this intermediate on development of an indigenous technology. RRL-Hyderabad completed the process flow diagram and the material balance for a 270 tonnes/annum plant based on the data of batch experiments. Flow sheets were also evolved for 100 tonnes/annum and 100 kg/day pilot plants of two chemical firms.

The polyurethane coatings exhibit excellent adhesion to various substrates and have superior water, chemical and solvent resistant properties. Under a project on the development of polyurethane coatings being pursued at the laboratory, investigations were made on single-component urethane coatings, castor oil-based prepolymers cured with catalyst, two-pack urethanes of Desmophen and Desmodur types and rigid foams. The single-pack urethane oil paints were generally approved as substitutes for the imported products of Russian and Italian specifications.

Optimum conditions were worked out on a 15 kg/batch scale for the production of tallow-like hard fat for soap-making from castor oil by a single-step process of simultaneous dehydration and hydrogenation. By this process, hard fat with any desired iodine

value and hydroxyl value (5-40) could be made from either commercial or BSS ('First') grade castor oil. The process is ready for demonstration.

Optimum conditions were arrived at for the laboratory-scale production of zinc phosphate from zinc oxide and phosphoric acid. Zinc phosphate has been reported to be as effective as red lead besides being nontoxic. The nonreactivity of zinc phosphate widens its formulation ability in developing all types of priming paints. Bench-scale experiments (5 kg batch) for the production of zinc phosphate were conducted to study the process parameters and reproducibility and to generate necessary data for designing a commercial plant. During the batch runs, a mother liquor consisting of excess phosphoric acid and dissolved zinc was recycled. It was observed that even after nine recycles the product conformed to the specification.

A one tonne/day cyclohexane pilot plant has been set up by the Gujarat State Fertilizers Co. Ltd, Baroda. The pilot plant will be used to establish conditions using indigenous catalyst developed by the laboratory and for effecting improvement over the technology imported by the firm earlier. This is an instance of an industrial unit going in for indigenous technology though it had imported the know-how earlier.

The production of glycerol monostearate and esterified wood rosin on the basis of RRL-Hyderabad know-how was started by Enpi Chemical Works, Bangalore. Blundell Eomite Paints Ltd, Bombay, started production of anti-corrosive paint suitable for use on ship bottoms and steel surfaces for protection against corrosion.

The erection of a 300 tonnes/annum plant, being set up by Andhra Farm Chemicals Corporation Ltd, Tanuku, was nearing completion. The civil work in respect of a 450 tonnes/annum plant for the production of monochloroacetic acid was in progress. The plant is being set up near Hyderabad by MCA Chemicals Ltd as a joint-sector project with Andhra Pradesh Industrial

Development Corporation Ltd. Work was also started for setting up a 900 tonnes/day low temperature carbonization plant at Ramakrishnapur in Andhra Pradesh. The plant was being set up by Singareni Coal Chemicals Complex at Ramakrishnapur.

RH-8, the new nonsteroidal, anti-inflammatory drug developed by the laboratory, was cleared by the Drugs Controller, Government of India, for manufacture and sale. Unichem Laboratories Ltd, Bombay, licensee of the process, would undertake the manufacture of this drug.

The Centre for Cellular and Molecular Biology put forward a theory that attempts to explain the growth regulation in higher organisms and identifies the crucial event that occurs when a normal cell turns cancerous.

Twenty-six research papers were published during the period covered under the report. Two patents were sealed and five patents were filed. □

CSIR's EXTRAMURAL RESEARCH

Removal of Cadmium from Industrial Effluents

Under a CSIR research scheme granted to Dr Y.K. Agrawal of the Pharmacy Department, Faculty of Technology and Engineering, M.S. University of Baroda, a new method has been developed for decontamination of cadmium from industrial effluents.

In this method, cadmium is removed from the effluents by precipitating as an insoluble cadmium sulphide by passing the effluents through a bed of commercial iron sulphide in a glass column in acidic media (pH 2.5-3.0). The acidic effluents react with FeS and get precipitated as CdS. The effluents are tested for absence of cadmium by diathiozone and atomic absorption spectrophotometer.

The method is simple, rapid and efficient for decontamination of cadmium. No prior separation or precipitation for foreign common metal

ions (present in effluent) is necessary. Commercially available FeS is cheap and can be used as such; no other chemical is required. The method is instantaneous and the experiment can be performed at high flow rate under suction.

Shri S.K. Patke, a senior research fellow is also associated with the work. □

Solar-Terrestrial Influences on Ionospheric Absorption of Radio Waves

In a CSIR research scheme granted to Dr K.M. Kotadia (investigator in charge), Professor of Physics, Gujarat University, Ahmedabad, and Dr J.S. Shirke (co-investigator), Associate Professor, Physical Research Laboratory, Ahmedabad, absorption of radio waves in the ionosphere is being measured, since 1972, at Ahmedabad by vertical incidence pulse Al-method on 1.8, 2.2 and 2.5 MHz. The project is likely to continue for a complete sunspot cycle and probably even up to the end of 1985 under the middle atmosphere programme (MAP) approved by the Committee on Space Research (COSPAR).

Some important results of the experiments are as follows:

(1) Absorption L_{db} depends on the time of the day or solar zenith angle χ in such a way that it is proportional to 0.90 power of $\cos \chi$ on the average. However, it changes from 0.70 to 1.1 during the course of a year, the minimum value being in winter and maximum in summer.

(2) An empirical relation connecting L_{db} with solar activity (represented by sunspot number R_z or 10.7 cm solar radio flux $S_{10.7}$) is established for times when $\cos \chi$ is equal to 0.6 and 1.0. It shows a good linearity between the two quantities. One can predict the radio wave absorption at a particular stage of solar cycle from this relation. The constants in the linear equation are functions of frequency and time of the day.

(3) Absorption data were used in deducing electron density-height ($N-h$) distribution profiles at altitudes 70-110 km, combining the ground-based partial reflection and ionosonde data and the rocket measurements. A good amount of computer exercise with complex variables was involved in trying out various interpolations and extrapolations in a particular height-gap until the final $N-h$ profile was in reasonable agreement with the observed radio wave absorption and the virtual height of reflection of the wave at a particular frequency. Profiles were obtained for three different solar angles in January, February and March 1975. A distinct ledge with a maximum at 95 km is a significant result because of its connection with metallic ions and the sporadic-E layer.

(4) Purely seasonal variation of absorption free from solar control showed maxima in equinoxes. These correspond to similar maxima at atmospheric pressure at 90-95 km which signifies the dependence of absorption on the electron collision frequency and perhaps on the seasonal changes in the atmospheric gas composition at that height.

(5) Absorption also depends on the radio wave frequency f , or rather effective frequency ($f + f_L$), where f_L is a longitudinal component of the electron gyromagnetic frequency. Total L_{db} varies inversely as 0.76 power of the effective frequency at $\cos \chi = 0.6$ and 1.11 power at $\cos \chi = 1.0$. This is found for absorption at solar minimum. The constant of proportionality A' varies as 1.28 power of $\cos \chi$.

Knowing the variability of absorption with solar activity, the time of the day and season from sufficient amount of data (at least over one solar cycle), it would be possible to derive a generalized law for the prediction of absorption under different conditions.

(6) The maximum absorption in the diurnal variation occurs somewhat later than the noontime, the delay being large in winter as compared to that in summer. It is found to change from

about 5 to 40 min. during the course of a year and interestingly the seasonal variation of this delay-time is opposite to that of the exponent n of $\cos \chi$ for diurnal variation in different months, e.g. n is maximum in summer when the delay-time is minimum and vice versa.

(7) Short-term changes like fade-outs during a solar flare and reception of strong signals when a blanketing type sporadic-E layer occurs were noted. No post-magnetic storm effect in radio wave absorption is found at Ahmedabad (23°N). Such post-storm effects are, however, found at mid latitudes. □

PATENTS INFORMATION

Indian Pat. 125/Cal/75*

A multi-exposure, high pressure X-ray powder diffraction camera

J. SINGH

National Physical Laboratory, New Delhi

The National Physical Laboratory (NPL), New Delhi, has developed a multi-exposure, high pressure X-ray powder diffraction camera. The unique feature of the camera is its built-in mechanism to provide the film holder with an attachment consisting of a tension screw and spring-loaded balls to attain the capability of recording several X-ray powder diffraction photographs on the same film in juxtaposition by enabling the vertical movements of the film holder in controlled steps. Powder photographs at different pressures and up to about 150 kilobar pressure can be recorded at ordinary temperature in about 5-6 hr exposure time.

Any sample available in wire form (powder samples along with a calibrant to sense pressure are mixed with a binder and extruded through a suitable die and then dried) is centrally located in a standardized boron-epoxy disc of 3 mm diam. and 0.25 mm thickness. The disc containing the sample is very carefully aligned/centered on the face of one of the two tungsten carbide pistons (preferably on the lower piston) each

having a flat face of 3 mm diam. and is squeezed between these two well-aligned (using a four-guide assembly) pistons actuated by a small hydraulic press.

Powder patterns are recorded in the region on either side of the direct X-ray beam. The patterns are of good quality and they enable the determination of the data free from the film shrinkage error. The accuracy is also good and has an edge over those available commercially for normal work having the same diameter. Moreover, the camera possesses the capability of recording photographically the so called reversible pressure induced transitions involving volume as well as structural changes. It is, therefore, an important tool for an experimentalist to conduct basic research in such areas. □

Indian Pat. 301/Cal/76*

A process for the production of an electrically conductive paper used as a substrate for applying zinc oxide electrophotographic layer

C.V. SURYANARAYANA, A.S. LAKSHMANAN & J. KUPPUSWAMI

Central Electrochemical Research Institute, Karaikudi

This patent relates to the formulation of a conductive composition to be applied to ordinary paper to enhance its electrical conductivity. Such a paper is used to prepare electrostatic photographic papers.

In this process, the paper is impregnated with an aqueous solution of a combination of an alkali chloride or perchlorate with similar anions of Group II or IIA elements, a salt humectant, and a binder resin. For example, a composition containing polyvinyl alcohol, ammonium perchlorate, magnesium perchlorate and sodium chloride may be used. An aqueous solution of these ingredients is impregnated on to the paper till it is thoroughly wet and then the paper is dried. The surface resistivity obtained is around 5 megohms per square at 40-45% relative humidity; untreated

papers show a surface resistivity of $(18 \pm 6) \times 10^3$ megohms per square at the same range of relative humidity. Variations in the composition are permissible as also in the ingredients of the composition. The surface resistivities depend on the composition and the substances used.

The paper so impregnated and dried is useful in the zinc oxide based electrophotographic process, wherein the sensitive coating is applied to this base paper. If the electrophotographic composition is coated on untreated paper in dry conditions, the electrostatic charging is slower and may be less uniform. Such a conductive treatment enhances the quality of the print. Also, the treatment minimizes the penetration of the solvent in the zinc oxide coating stage. □

Indian Pat. 1179/Cal/76*

Improved process for the production of zinc phosphate using zinc oxide

H.V.K. UDUPA, K.C. NARASIMHAM, S.N. GURUVIAH & V.S. CHANDRASEKARAN

Central Electrochemical Research Institute, Karaikudi

Though the use of zinc phosphate as an anticorrosive pigment has been well established in the west, it is not widely used in India. Zinc phosphate pigment can be used for the preparation of anticorrosive primers for preventing corrosion of ferrous metals. Zinc phosphate reduces the diffusion rate of ammonium ions through paint film and slowly phosphates the metal surface. Zinc phosphate in primers promotes excellent intercoat adhesion, particularly under high humidity. Primers containing zinc phosphate are not toxic.

The Central Electrochemical Research Institute, Karaikudi, has developed an improved process which consists in reacting stoichiometric quantities of zinc oxide or zinc carbonate and orthophosphoric acid. Zinc oxide/zinc carbonate in a slurry form with water is added to a calculated

*Accepted.

*Accepted.

*Accepted.

quantity of suitably diluted orthophosphoric acid under constant stirring. Zinc phosphate formed is filtered and washed in a centrifuge. The physical properties of the pigment conform to BS: 5193-1975. The primer prepared by using the zinc phosphate has been evaluated by electrochemical, accelerated and field tests, and the performance has been found to be satisfactory.

The cost estimates for a unit of capacity 300 tonnes of zinc phosphate per annum are as follows: fixed capital on equipment including erection charges, Rs 4.51 lakh; and working capital (for 90 days), Rs 14.53 lakh. The cost of production and profitability are estimated at Rs 18.5/kg and 55% respectively. □

Indian Pat. 1241/Cal/76*

Improvements in or relating to a process for preparation of fluorescent marking ink

C.V. SURYANARAYANA, M.I.A. SIDDIQI, N. RAJARAM, K.K. GOPINATHAN & R. LAKSHMINARAYANAN

Central Electrochemical Research Institute, Karaikudi

The process broadly comprises in formulating from a filtered solution of a plant product in alcohol and an aqueous solution of a fluorescent substance such as fluorescein or acriflavin and a filler to increase the viscosity, an invisible ink, which, when applied to the hand, is substantially invisible in ordinary light and luminesces, in visible range, when exposed to longwave ultraviolet radiation obtained from a mercury vapour lamp. The invisible ink has other desirable properties also, such as adhesion for a suitable duration of time, required in most of its applications, and easy washability thereafter, and non-toxicity.

The ink can be used for effective readmission control at fairs, race tracks, etc.

The CECRI method is simple and elegant. The materials and equipment required are indigenously available. The stamping ink is completely harmless to

skin and clothing and the marking ink stands several hand-washings and stays necessary length of time for most of its applications.

The cost of production is Rs 50/litre. □

PERSONNEL NEWS

Appointments/Promotions

Shri C.V. Gangadhara Reddy

Shri C.V. Gangadhara Reddy of the National Institute of Oceanography (NIO), Goa, has been promoted as Scientist EI at NIO with effect from 9 May 1979. He now heads the Chemical Oceanography Division of the laboratory.

Shri Reddy (born 29 Nov. 1930) obtained his master's degree in chemistry of foods and drugs in 1954 from the Andhra University. After working for a few years in the Chemical Oceanography Group of the Central Marine Fisheries Research Institute, he was taken by INCOR in 1962 to participate in Indian Programme of the International Indian Ocean Expedition. He joined as Scientist B at NIO as soon as the laboratory was established in 1966. Since then he has been engaged in different aspects of chemical oceanography. He has participated in oceanographic cruises of Indian and foreign ships. In 1969 he visited UK under the Exchange Programme and had been to almost all the oceanographic institutes of that country.

In 1971 Shri Reddy was promoted to Scientist C and since then he has been involved in the Chemical Oceanography Division of the laboratory as its scientist in charge. His main contributions have been in chemistry of nutrients and their regeneration in the sea. He has also worked on the chemistry of marine sediments and marine pollution. Lately he has developed interest in drugs from marine plants and animals and is leading the project 'Drugs from the sea'. He has published more than 40 research papers.

Shri Reddy has also been recognized as an expert in chemical oceanography

problems by the Fisheries Resources and Exploitation Division of the FAO, Rome.

Dr R. Sen Gupta

Dr Rabindranath Sen Gupta of the National Institute of Oceanography (NIO), Goa, has been promoted to Scientist EI at NIO with effect from 9 May 1979.

Dr R. Sen Gupta (born 1 Oct. 1932) obtained Filosofic Doktor (Ph.D.) in oceanography (1973) from the Institute of Oceanography, University of Gothenburg, Sweden. During his stay in that university (1964-1973), he was involved in hydrographic and hydrochemical studies of the Baltic Sea—one of the most polluted seas of the world.

Since he joined NIO in 1973, Dr Sen Gupta has been engaged in researches on chemical oceanography and pollution studies in the Indian seas. He has made important contribution in Marine Environmental Monitoring and Marine Living Resources Assessment Programme for the Indian Ocean Region sponsored by the United Nations Environment Programme (UNEP).

Dr Sen Gupta is a member of various committees like the Environmental Protection Advisory Committee of the Indian Standards Institution, and the Executive Committee of Goa Safety Council. He is a recognized guide for M.Sc. and Ph.D. (marine chemistry) of a number of universities. He has more than 40 research papers to his credit.

Dr Sen Gupta is the regional coordinator for Marine Pollution (Petroleum) Monitoring Pilot Project (MAPMOPP) of the Integrated Global Ocean Station System (IGOSS) of IOC/Unesco.

Dr Sen Gupta's present responsibility is to develop capabilities and know-how on problems related to chemical oceanography and marine pollution.

* * *

The following have been promoted, consequent on 5-year assessment, at the

*Accepted.

National Institute of Oceanography (NIO), Goa:

As Scientist C

Dr D.P. Rao (17 Aug. 1978); Shri M.J. Varkey (17 Aug. 1978); Shri P. Udaya Varma (22 Aug. 1978); Shri Ch. Madusudhan Rao (17 Aug. 1978); Dr A.H. Parulekar (3 June 1977); Dr A.G. Untawale (18 Aug. 1978); Shri R.M.S. Bhargava (17 Aug. 1978); Dr P. Sivdas (20 Aug. 1978); and Shri V.P. Devassy (17 Aug. 1978).

As Scientist B

Shri B.M. Pannikar (6 Dec. 1975); and Dr (Mrs) M. Saraswathy (5 Oct. 1978).

As Scientist A

Shri Ayyappan Nair (17 Aug. 1978); Shri R.M. Kidwai (17 Aug. 1978); Shri B.G. Wagle (17 Aug. 1978); Shri M.V.S.N. Guptha (17 Aug. 1978); Shri P.S. Gore (23 Nov. 1976); Shri T.C. Gopalakrishna (28 Aug. 1977); Dr V. Shanthakumari (11 Oct. 1978); and Shri K.K.C. Nair (20 Oct. 1978).

Appointments at NIO include those of Shri S.G. Diwan (on promotion, as Scientist B; 16 April 1979); Shri T. Balasubramaniam (on promotion, as Scientist B; 3 May 1979); Shri K.S.R. Murthy (as Scientist B; 21 April 1979); Shri K.K. Varma (on promotion, as Scientist B; 29 May 1979); and Shri M.P. Tapaswi (as Jr Documentation Officer; 17 May 1979). □

PATENTS FILED

755/Del/78: Housing of skaneyes—a road safety device, S.K. Basu, R.C. Bishnu & M.K. Banerjee—CMERI, Durgapur.

48/Del/79: Process for the preparation of a new RNA degrading protein from seminal plasma, K.H. Scheit—Max Plank Institute, West Germany; and E.R.S.P. Reddy, T.R. Murti, M.W. Pandit & P.M. Bhargava—RRL, Hyderabad.

56/Del/79: A new process for the production of immobilized pancreatic enzyme product for use as bates for leather manufacture, R. Puvanakrishnan, S. Bose & S.C. Dhar—CLRI, Madras.

117/Del/79: Wood chipper, U.C. Borah, K. Dutta & U. Choudhury—RRL, Jorhat.

132/Del/79: CLEANALL—A product comprising wetting agent (Noigen XX 400) 5%, solvent (acetone) 40%, lubricator (TRO) 3-5% and water to make up 100, R. Sundaram, T.S.K. Mahadevan, K.K.G. Anand Dev, K.S. Jayaraman & T.S. Ranganathan—CLRI, Madras.

133/Del/79: A manually operated pedal pump for irrigation purposes, R.K. Verma, G.K. Verma & R.N. Rao—CMERI, Durgapur.

190/Del/79: A process for the recovery of selenium from its coatings on aluminium, P.C. Mehendru, D.C. Parashar, N. Kumar, M.N. Kamalasanan & R.C. Bhatheja—NPL, New Delhi. □

PATENTS SEALED

142/Cal/75 (143706): An improved process for the fabrication of thin film capacitors, A. Singh & Y.K. Jain—CEERI, Pilani.

1482/Cal/75 (143869): Improvements in or relating to the electrolytic reduction of *o*-nitrophenol to *o*-aminophenol, H.V.K. Udupa & P.N. Anantharaman—CECRI, Karaikudi.

1332/Cal/74 (143567): Coil-less electromagnetic relay, R.K. Choudhry & A. Lal—CMERI, Durgapur.

813/Cal/75 (143715): A process of recovering precipitated calcium carbonate from press mud of sugar factories following carbonation process for classification of sugar cane juice, S.C. Das & S.N. Dutta—RRL, Jorhat.

1121/Cal/75 (143806): Improvements in or relating to the process for the production of negative active material for pocket type and pressed mass type nickel cadmium cells, H.V.K. Udupa, P.V.R.V. Rao, R. Sabapathi & V. Chidambaram—CECRI, Karaikudi.

1177/Cal/76 (143751): A process for the extraction of hecogenin from sisal juice and its subsequent conversion to its acetate, C. Srinivasulu, K.

Vijayalakshmi, K.M. Rao & S.N. Mahapatra—RRL, Bhubaneswar.

1304/Cal/76 (143759): A process for the synthesis of oxopyrimidines, P.C. Jain, K.S. Rajput & C.R. Prasad—CDRI, Lucknow.

1413/Cal/76 (143743): Method for the preparation of iron oxide-chromium oxide catalyst by precipitation from homogeneous solution, J.P. Rao & B.R. Sant—RRL, Bhubaneswar.

1223/Cal/76 (143717): A process for the manufacture of methyl anthranilate from phthalimide, M. Bapuji, Y.R. Rao & S.N. Mahapatra—RRL, Bhubaneswar.

2106/Cal/75 (143888): Thermal sensing alarm, V.G. Bhide, M.M. Pradhan, S.P. Verma & R.K. Garg—NPL, New Delhi.

1819/Cal/75 (143870): A process for the manufacture of sponge iron for making steel in electric furnaces, D.N. Dey, A.K. Jouhari, A.K. Tripathi & P.K. Jena—RRL, Bhubaneswar.

697/Cal/75 (143745): Preparation of iron oxide black red pigments, T.P. Prasad, V.V. Ramasastry, J.S. Murty & B.R. Sant—RRL, Bhubaneswar.

2169/Cal/75 (143801): Improvements in or relating to the preparation of activated carbon sawdust, B. Mohanty, K.S. Narasimhan, S.N. Mahapatra & P.K. Jena—RRL, Bhubaneswar.

838/Cal/75 (143850): A process for making high polymeric dispersants suitable for effecting separation of clays and other materials, T.C. Saikia, G.K. Tinke, J.P. Moyalan, B.D.M. Chakravarty, D. Ganguly & S.N. Dutta—RRL, Jorhat. □

Regional Union Catalogue of Scientific Serials: Durgapur

The Central Mechanical Engineering Research Institute (CMERI), Durgapur, has brought out a catalogue with the above title. The catalogue, which represents the serial holdings of 11 science libraries of Durgapur, has been designed to serve as a comprehensive location tool for the entire serial holdings of the consortium libraries and

goes beyond the main classes 5 and 6 (science and technology) of the Universal Decimal System to include 2560 titles in total.

The catalogue gives the titles with bibliographical collation arranged in alphabetical order, and the classified index. The rendering of titles follows the pattern of the 'World List of Scientific Periodicals published in years 1900-1960', and the titles are arranged in alphabetical sequence of important words. Acronyms are taken as words and alphabetized accordingly. International conferences and symposia are rendered under their official English names, and arranged accordingly in the main part.

The catalogue has been compiled by Shri P.K. Chaudhury and Shri S.C. Roy of CMERI.

Further particulars can be had from the Director, CMERI, Durgapur 731209.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 11/79

It is proposed to appoint two Scientists F (Deputy Directors) at the National Chemical Laboratory, Pune.

Job Requirements: For Post (i)—This is a senior research management position and the incumbent would be required to provide high level leadership in basic and applied research in the area of polymer chemistry. The incumbent would be expected to expend and intensify the efforts in the existing Polymer Chemistry Division which has major research programmes in the area of polymers for industry and agriculture, polymer synthesis, polymer characterization, etc. He will be required to assist the Director in planning and execution of projects, and in transfer of polymer technology in association with the polymer engineering and process development groups of the laboratory.

For Post (ii)—This is a senior research management position and the incumbent will be required to provide high level leadership in research and development in the general area of inorganic chemistry with particular reference to chemistry of coordination and organometallic compounds, homogeneous catalysis and bioinorganics. He would be required to assist in planning and execution of projects and in transfer of technology. One of the important requirements would be that the incumbent will

promote research of a high order and develop a school of excellence.

Qualifications: For Post (i)—The candidate should possess high academic qualifications in polymer chemistry or in any other branch of chemistry with several years' research experience in polymer chemistry. He should have an established record of research excellence as evidenced from his publications.

For Post (ii)—The candidate should possess high academic qualification in inorganic chemistry and should have established record of research as evidenced from his publications.

Salary/Conditions of Service: The salary scale attached to the posts is Rs 2000—125/2—2500. Initial pay will be fixed according to merits. The persons selected will be appointed on contract for a period of six years which would be confirmed after an initial period of two years of satisfactory service. Qualifications and experience are relaxable in the case of candidates otherwise found suitable for the posts. Other conditions of contract will be supplied on request.

Age Limit: Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain two copies of the standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific and Industrial Research, Rafi Marg, New Delhi 110001. They may also obtain a brochure on the aims and objects and the latest annual report of the laboratory. Completed *curriculum vitae* proformae will be received in this office on or before 1 September 1979.

Canvassing in any form and/or bringing in any influence political or otherwise, will be treated as a disqualification for the posts. □

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 12/79

It is proposed to appoint two Scientists F (Deputy Directors) at the National Metallurgical Laboratory, Jamshedpur.

Job Requirements: For Post (i)—To assist the Director in the planning, programming, coordination and evaluation of research, development and pilot plant projects; identification of technological problems; man-power management; etc. and such other duties as may be assigned by the Director from time to time. The post is transferable.

For Post (ii)—The candidate will be required to conduct and organize research in the field of hydro- pyro- and electro-metallurgy involving the establishment of a large scale testing

facilities complex, covering planning of plant and buildings layout, drawing up of equipment specifications, design of specialized process plant, management and coordination, help in evaluation of research programmes in the laboratory as well as developmental and pilot plant projects, transfer of techniques from the laboratory to industry and the field.

Qualifications: For Post (i)—High qualifications in metallurgy or metallurgical engineering with established record of research and development in a research laboratory covering a wide spectrum of metallurgical technology and with proven ability of research management and administration. Experience of planning and execution of development projects in a research laboratory is essential. Experience in technology forecasting and dealing with government/departments and public sector undertakings is desirable.

For Post (ii)—High academic qualifications in metallurgical or chemical engineering and considerable research experience in metallurgical/chemical engineering or allied fields. Scientists and technologists with high academic qualifications in other branches of science, who have worked in subjects related to metallurgical/chemical industry will also be considered. Proven ability of funding research and research management, experience of planning and execution of development and engineering projects are desirable. Persons having long experience in management and project coordination with a flair for process design will be given preference.

Salary/Conditions of Service: The salary scale attached to the posts is Rs 2000—125/2—2500. Initial pay will be fixed according to merit. The persons selected will be appointed on contract for a period of six years, which would be confirmed after an initial period of two years of satisfactory service. Qualifications and experience are relaxable in the case of candidates otherwise found suitable for the posts. Other conditions of contract will be supplied on request.

Age Limit: Below 50 years, relaxable in special cases.

Scientists/technologists interested may obtain two copies of the standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific and Industrial Research, Rafi Marg, New Delhi 110001, on or before 7 August 1979. They may also obtain a brochure on the aims and objects and the latest annual report of the laboratory. Completed *curriculum vitae* proformae will be received in this office on or before 8 September 1979.

Canvassing in any form and/or bringing in any influence political or otherwise, will be treated as a disqualification for the posts. □



CSIR NEWS

A SEMI-MONTHLY HOUSE BULLETIN OF CSIR

VOL 29 NO 15 15 AUGUST 1979

CFTRI Processes and Products

The following processes/products have emerged from the R&D activities of the Central Food Technological Research Institute (CFTRI), Mysore.

Leaf Cup Making Machine

A machine for making cups (*donnay*) and plates from dried leaves, developed by CFTRI, has been successfully field-tested. Using this machine, cups of different shapes and sizes can be produced from dried leaves, and also from paper, at the rate of 250 cups/hr. A craftsman with a helper can produce about 2000 cups a day (8 hr) and can earn Rs 18-20/day with this machine. A daily production of 800 cups is possible from areca sheath, leading to a net earning of Rs 20.

Adoption of this inexpensive pedal-operated machine can offer significant advantages in the production of cups. Hundreds of families in the rural and tribal areas of the country eke out their living by making package forms from forest and agricultural wastes like leaf sheaths of areca palm, and dried leaves of banana, *Butea* (*palas* or Flame of the Forest) and *Bauhinia* (Camel Foot or Adda leaf).

Traditionally, the dried leaves are softened by moistening, stitched into cups with thin split reeds, and nested immediately without proper drying. The moisture retained in the cups eventually causes mould growth. These stitched forms are often leaky, insufficiently rigid for safe handling, and are crude. Production rate is also low (100 cups/hr). The machine designed by CFTRI overcomes these defects and produces hygienic package forms with

better strength and functional qualities.

For better strength and resistance to tear, a combination of dried leaves and paper can be used, giving a laminated structure. For higher moisture resistance, a thin film of polyethylene could be sandwiched between the two layers of the laminate.

The machine costs less than Rs 3000 and consumes about 300 W of power. Its adoption in rural and tribal areas, where dried leaves are abundantly available, would help increase the incomes of the economically weaker sections of the population.

Tamarind Powder

The laboratory has developed a simple process for making dehydrated tamarind powder. The process overcomes the disadvantages of the conventional method of extracting tamarind juice, i.e. by soaking the pulp in water for some time and squeezing the pulp, wherein not all the juice present is extracted.

Packed in high-density polyethylene pouches, tamarind powder is a hygienic, easily dispersible product with the original flavour of tamarind. The machinery and equipment like driers, disintegrators, mixers and pouch sealers required for the process are indigenously available. The cost of the product works out to be around Rs 6/kg. A limited survey conducted in and around Mysore City showed that the product is acceptable to the consumers.

The process know-how has been released to an entrepreneur, and the product is expected to be introduced in the market soon.

Interested parties can have the process know-how from the National Research Development Corporation of India (NRDC), New Delhi, on payment of a lumpsum premium of Rs 5000.

Filter for Aflatoxin Removal

CFTRI has developed a filter for the removal of aflatoxin, a potent carcinogenic agent, from unrefined groundnut oil. The filter can be easily fitted into expeller oil mills, with minimal expenditure, to eliminate the health hazards of aflatoxin which may be present in unrefined oil.

Aflatoxin is produced by a mould which could flourish in inadequately dried groundnuts. It gets into the oil when infected kernels are used for oil extraction. Refining processes, undoubtedly, remove all the toxins from oil, but a sizable portion of India's population uses unrefined oil. Contaminated oil is injurious to health, and even the food prepared in it picks up substantial amounts of the toxin, thereby causing health problems.

Preservation of Fruits and Vegetables

CFTRI carries out post-harvest handling of fruits and vegetables at its experimental stations in the different parts of the country. The laboratory has set up appropriate low-temperature and

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humidity conditions to increase the storage life of various fruits and vegetables. It has also developed simple and inexpensive alternative methods of storage, e.g. wax coating of fruits, antifungal paste for banana, dip treatment for mango, and dehydration technique for a number of fruits and vegetables.

The laboratory has formulated several wax emulsions especially suited for different fruits. Permitted fungicides are incorporated in the wax emulsions to prevent fungal damage. Wax treatment is not recommended for vegetables like cauliflower, cabbage, French beans, beet root, knol knol, spinach and raddish. CFTRI supplies wax emulsions to orchardists and marketing organizations on payment. The process for its preparation is available through NRDC on payment of a lumpsum premium of Rs 2500.

Application of the antifungal paste developed by the laboratory on the cut portions of bunches and hands of banana prevents fungal attack for as long as 20 days. Use of the antifungal paste, along with the procedure evolved by the laboratory for harvesting, handling, packing, transporting and storage of bananas, has paved the way for successful shipment of Indian bananas to distant foreign markets.

Microbial spoilage that occurs during ripening of certain varieties of mangoes can be reduced by simple hot water dip treatment. Mango and mango products are important export items and the processors will greatly benefit by using the technique.

CFTRI has standardized the conditions for dehydration of banana, grape, potato, carrot, green peas, cabbage, cauliflower, garlic, onion, beet root and bittergourd. The demonstration of dehydration of some of these items is arranged on payment. Some of these products have good export markets.

An improved method of sun-drying of chillies, after an emulsion treatment, has been worked out and demonstrated under field conditions. □

Deputation Briefs

Dr (Miss) A. Thangamani of the Indian Institute of Experimental Medicine (IIEM), Calcutta, was deputed to USA under the CSIR-NSF Exchange of Scientists Programme. During her stay in USA from 6 April to 17 May 1979 she visited the following departments/universities: Bioengineering Department, Rutgers University, New Jersey; Pharmacology Department, Pennsylvania University, Pittsburgh; US Army Research and Development Laboratory, Bioengineering & Food Science Department, Natick; Food Science Department, Massachusetts Institute of Technology, Cambridge, Boston; and Roswell Park Memorial Institute, Buffalo.

The major activities at the first two laboratories were related to immobilization of enzymes and whole cells in collagen membranes for industrial and medical applications. Examples of the latter are L-asparaginase, urokinase, neuraminidase and glucose oxidase. At Natick Dr Thangamani saw various aspects of the cellulase project starting from pretreatment of cellulosic wastes, fermentative production of cellulase and cellobiase from *T. viride* and an *Asparagillus* sp. and their use in the complete degradation of cellulosic wastes to glucose.

She gave two lectures one each at the Rutgers University and the Army Laboratory relating to the work of her group at IIEM on fungal enzymes.

She also attended the annual meeting of the American Society of Microbiologists at Los Angeles.

* * *

Shri V.K. Vaish of the Central Glass & Ceramic Research Institute, Calcutta, was deputed to the German Democratic Republic (GDR) under the Indo-GDR programme of cooperation in science and technology from 5 to 20 June 1979 to familiarize himself with the production and development of optical glass. Shri Vaish visited the Optical

Glass Works of Schott and Jenosen at Jena and Schleiz. The visits provided him an opportunity to study the melting operations of optical glasses in clay pots, platinum crucibles, and platinum-lined tanks. He visited the batch house and the testing laboratories and discussed various problems relating to production of optical glasses. At Schleiz, he studied the processing and moulding of optical glass blanks and other shapes. Shri Vaish also exchanged views on the development of new types of optical glass, glass filters and heat absorbing glass. □

PROGRESS REPORTS

CMERI Report: 1976-78

The report of the Central Mechanical Engineering Research Institute (CMERI), Durgapur, for 1976-78, published recently, reveals that 135 projects were investigated during the period and out of these, 39 projects were completed.

The R&D efforts of the laboratory as well as those of the various centres of the Mechanical Engineering Research and Development Organisation (MERADO) to develop industrial and other heavy machinery have helped many industries to achieve technological self-reliance. In keeping with the recent stress laid by the government on the growth of small industries and rural development, the laboratory has been successfully concentrating on programmes having relevance to such growth. Another field of special endeavour has been the utilization of solar energy/low-potential energy sources.

The laboratory has developed in collaboration with industry a high-speed paper lapping machine for communication cables as an import substitution item. Already 12 such machines have been made and installed in the works of the user industry and these are working highly satisfactorily. The user industry proposes to obtain 95 such machines in the first instance.

Foreign exchange conserved is Rs 40,000 per machine.

A single-stage, high-speed, radial bladed, centrifugal compressor has been developed and this opens up a new avenue for the development of high-speed compressors in India for process industries, fertilizers, chemicals and cryogenic industries, solar power units, etc.

Work on the development of a liquid pump utilizing unconventional energy sources, like solar energy or any other low-temperature heat source, was continued. The prototype pumped water at the rate of 15 litres/min. and the head developed was 6 m. A pump with higher capacity was being designed.

The development of an analog computer for basic studies of thermodynamics flow and stress system was taken up. The project aimed at developing a suitable analog computer (dc network analyzer), with at least 100 nodes to start with, which is required in connection with the studies of various complex, two- and three-dimensional heat flow problems and thermal stress in transient conditions such as solidification of castings, heat transfer in metals, and design of heat exchangers. A network analyzer simulation model has been developed with provisions for applying initial and boundary conditions. The model has been tested with one- and two-dimensional heat transfer systems. The accuracy of the model has been tested by comparing the results obtained from the simulation network with the actual analytical solution of the problem obtained from a digital computer.

Conversion of oil-fired furnaces to coal-fired ones has also been achieved by developing a fluidized bed burner. A Nestler oil-fired boiler of 550 lb/hr steam output has been successfully converted.

A vertical bin type continuous solar grain dryer (av. capacity, 1 tonne/day) has been designed, fabricated and installed. Grain is dried continuously by flow of hot air at right angles to the vertical bed of grain moving downwards

owing to gravity between two perforated sheet chambers. The downward movement of the vertical bed of grains is controlled by manually operated valves. The drying of hot air at right angles to the falling bed of grains provide high thermal efficiency. A novel type of solar collector of matrix type has been designed and used for heating air. The collector is cheap and has a high thermal efficiency.

MERADO-Madras has developed a hydraulic leather shaving machine, 1250 mm wide, for the first time in the country. MERADO-Durgapur has developed a 12-tonne continuous drive friction welding machine for joining similar and dissimilar metals. Both these machines have been licensed for commercial production. MERADO-Pune has developed a magnetic particle clutch used in variable feed drives, for which it has been awarded a prize by the National Research Development Corporation of India (NRDC). This centre has also developed an orbital polishing machine, a drum charger, etc. MERADO-Ludhiana has developed a sophisticated and automatic assembly machine for knitting needles.

In its attempts for mechanization of agriculture for the benefit of the vast majority of the country's rural population engaged in agriculture, the laboratory has recently completed the development of a power tiller to facilitate the Japanese method of cultivation and for wet-land farming. A potato digger has also been developed. MERADO-Ludhiana has developed a reaper for harvesting wheat. A bullock-drawn groundnut digger has also been developed by this centre.

A continuous agitating processing cooker specially suitable for small scale canning units was designed by MERADO-Madras. The design drawings were prepared, based on which a prototype machine was fabricated by the sponsor under the supervision of MERADO. The machine underwent successful trial runs. The cooker is meant for processing canned fruits, like pineapple, at atmospheric pressure

under controlled temperatures of up to 100°C. It minimizes manual handling and the advantages over batch production process are fast production, better cooking, low cost of the equipment and compactness. The production/processing ratio is 700 cans/hr for A2½-size cans.

A special-purpose, high-speed hydraulic press of capacity 70 tonnes was designed and developed for the production of building blocks from laterite soil.

A direct lift type deep well hand pump has been developed by the Madras centre for rocky and hard soil areas. Thirty thousand pumps are presently under manufacture and these will be installed in remote villages where filtered water is scarce.

For cold storage of perishable foodstuffs and for airconditioning purposes, the laboratory is developing an absorption refrigeration plant utilizing solar energy, and alternatively low-potential waste heat.

To promote small industries, the laboratory and the MERADO centres have developed a few equipment and machines during 1976-78. The electrochemical marking machine for marking brand names and monograms on a wide range of metallic products; automatic digital electronic weigher for measurement and recording of material conveyed by belt conveyors; tip ice machine for the production of ice tablets for hotels, restaurants and hospitals; portable pipe cutting and bevelling machine for uniform and waste-free cutting of pipes; etc. are some examples.

Design and developmental assistance was rendered to a public sector undertaking for machining helical screw compressor rotors of circular arc profile. These rotors are presently imported at a cost of Rs 4 lakh per pair. Investigations on coke oven door failure at the Durgapur Steel Plant, advice on dynamic balancing of turbine rotor at Patratu Thermal Power Station, investigation and rectification of high eccentricity in the IL/IP rotor shaft of a 120 MW turbine unit of the

Maharashtra State Electricity Board, investigation into the causes of high vibration ID fan of Unit 2 of the Durgapur Thermal Power Station, etc. are other important examples of services which have proved to be very helpful to the key industries. The laboratory also participated in the preparation of UNIDO report for the promotion of manufacturing of engineering goods in the least developed countries, and for capacity assessment of wire drawing units holding COB licence.

Seventeen patents were filed during the period under report and 120 papers were published/presented at symposia. □

NIO Annual Report: 1978

The National Institute of Oceanography (NIO), Goa, has published its annual report for 1978. According to the report the laboratory's research and development programme was pursued under 23 projects, of which 6 were started during the year. Priority was given to the all-India coordinated and rural development projects. Twelve projects, sponsored by the public and private undertakings, were also undertaken. The total financial inputs received by the laboratory under the sponsored projects amounted to Rs 43 lakh and the main areas of work were pipeline routes and related surveys in the sea, pollution control and coastal protection. The laboratory continued to participate in the programmes of international organizations, viz. IOC, FAO, UNEP and Unesco, in such areas as marine resources, environmental research, pollution control, and scientific information and data management.

The research vessel *Gaveshani* completed 19 cruises covering 317 stations and 18,000 line-km in the Arabian Sea and the Bay of Bengal. These cruises provided information required in the various R&D projects related to marine living and non-living resources, and on physical and chemical processes and environmental conditions of the seas around India.

The laboratory made preparations for participation in the Monsoon Experiment, Monex-79. Detailed planning for the proposed oceanographic studies was carried out. The research vessel *Gaveshani* was equipped with the instruments for making special observations during the expedition.

The BT data collected on board the Russian research vessels during Monsoon-77 were analyzed. Depth-temperature profiles at three-hourly intervals were plotted. These data show that the mixed layer deepens from about 40 to 90 m in a time span of about one week in late June. The sea surface temperature decreases by about 2°C which is associated with the deepening of surface layer.

Studies on the hydrographic characteristics in the inner harbour of Cochin port were continued under a project sponsored by the Cochin Port Trust for the development of harbour. Seasonal variations in physical characteristics, temperature, salinity, suspended sediment load and currents at the inlet of Cochin harbour were investigated. The tidal prism for the harbour inlet was also calculated.

Research activities under chemical oceanography sub-discipline centred around: (i) chemical studies in the coastal and offshore waters of the Arabian Sea and the Bay of Bengal, and (ii) drugs from the sea. Of the 65 marine organisms (plant as well as animal) examined, two coral specimens showed promising antifertility activity. Bromine contents of 19 species of seaweeds from the Goa coast were determined spectrophotometrically. The bromine content, on a dry weight basis, varied from 0.024 to 0.247% for green algae, from 0.020 to 0.400% for red algae and from 0.015 to 0.054% for brown algae. Only two species, viz. *Chondria armata* and *Codium elongatum*, showed relatively high bromine content, 0.400% and 0.247% respectively.

Effects of three different refined petroleum products on the fruits of *Rhizophora mucronata* and *Avicennia officinalis* were investigated. General

damage such as burning, yellowing and wilting of the leaves associated with root damage was observed. The production ecology of *Halophila beccarii*, a seagrass, growing in mangroves revealed high biomass (26.44 g/m²) in October, maximum concentrations of nitrate (7.02 µg at/l) in July, phosphate (2.21 µg at/l) in November, and carbohydrate (476.78 mg/g) in May and August.

Heavy metal concentration in the foliage of seven species of mangroves was studied and in spite of the high concentration of iron and manganese no adverse effects were noticed on the foliage.

Aerial photographs of seven estuaries of Goa were used for studying the distribution of mangroves. Mangrove soil showed a very high population of bacteria (1764×10^3 /g dry wt) and fungi (15.24×10^3 /g dry wt). The dehydrogenase activity was very high in the soil.

Studies on different aspects of bloom were continued. A diatom bloom in combination with *Trichodesmium* sp. was observed in the vicinity of Cochin barmouth.

Zooplankton associated with *Trichodesmium* bloom was also studied. The bacterial flora associated with the bloom were low at the initial stage but attained a peak at the decaying stage of the bloom. The population was of the magnitude of 3.6×10^4 /ml unlike in non-bloom area where it was 3.96×10^2 /ml.

Coastal aquaculture studies were carried out in the waters of Goa and Cochin.

Dimensional relationship between different morphometric and meristic characters of green mussel (*Mytilus viridis*) grown on ropes and those obtained from the natural populations was determined in the waters of Goa. Ratios were found to be significantly different in these environments. Shell depth was found to be a useful parameter for estimating biomass. Weight parameters showed consistently higher values for raft-grown mussels.

Studies on the growth of weaving mussel (*Modiolus metcalfei* Hanley) on floating rafts and a comparison with those found in the natural bed revealed that rope-grown animals had a growth rate higher than the growth rates of the natural population and the attainment of marketable size was quicker in the population grown on rafts.

An indigenous formulation in the form of dry diet pellets was experimentally assessed for physical stability and biological evaluation in paleomonid and penaeid prawns. The diet is highly water-resistant, consumable and assimilable and can also withstand a wide range of salinity.

Ecological studies of tidal ponds located at the southern end of Ramanthuruthu Island near the Cochin barmouth showed that these ponds were very rich in selected species of benthic organisms such as tanaidaceans and a few species of amphipods—all highly preferred food of the growing juveniles of prawns which enter the ponds with the tide. A detailed physicochemical and biological study of the environment has been taken up in order to understand the ecological factors of an ideal nursery ground for prawns.

At the request of the Bombay Port Trust the laboratory undertook the survey of several pipelines laid earlier between Trombay and Butcher Island. The extent of exposure was detected by employing side scan sonar and sparker and by diving operations. Three pipelines were found to be exposed in the mid channel region where the maximum current speed was 150 cm/s. Temporary remedial measures were suggested and executed to support the exposed portions by blocking the gaps with high-density polyethylene bags filled with quick-setting cement and reinforcing the area with concrete blocks or stones.

The laboratory also surveyed the submarine oil pipeline routes from Bassein to Gujarat at the request of ONGC. Under the project, four different routes, i.e. from Bassein to Navapur, Tarapur, Daman and

Umbhrat, were surveyed. About 1788 line-km of echosounding, 1679 line-km of side scan sonar and 1742 line-km of shallow seismic profiling were carried out and 27 grab samples, 18 core samples and one dredge sample were collected from 32 stations. Besides, tidal and current observations in the area and extensive studies on macro, meio and microfauna were also made.

ONGC also sponsored a survey for the location of well head BH 16 in south Bombay High. The survey indicated that the depth in the adjacent area varied from 77 to 81 m but at the well head from 79 to 80 m. The sea bed was uneven and appeared to be covered with hard, presumably sandy material. The sonographs recorded spud marks of the drilling vessel at the site.

A directory of marine research centres in the Indian Ocean region was prepared and released under the UNEP project 'Marine Environmental Monitoring and Marine Living Resources Assessment for the Indian Ocean Region'. The directory includes details of 78 institutions in the Indian Ocean region including 27 institutions from India.

One hundred and four research papers were published during the period. □

CSIR's EXTRAMURAL RESEARCH Atomic Photoionization Cross-Section for Gamma Rays

In view of the errors and inconsistencies in the available data on photoionization cross-section of gamma rays, Shri C.R. Ranganathaiah, a CSIR senior research fellow working at the Physics Department of the University of Mysore under the guidance of Prof. B. Sanjeevaiah, head of the department, developed a coincidence method for the direct estimation of K-shell photoionization cross-sections.

The method involved the detection of photoelectrons in coincidence with the K X-rays that follow the ejection of

photoelectrons during gamma ray interaction. K X-ray emission was considered isotropic. Shri Ranganathaiah assembled a plastic NaI(Tl) scintillation fast-slow coincidence spectrometer in conjunction with a multichannel analyzer.

Photoelectrons released during the gamma ray interaction with the target were detected by a flat circular plastic scintillator (NE102) and the K X-rays by a thin NaI(Tl) scintillator having thin beryllium window. The target foil of element under investigation was punched to 1.98 cm diam. and was placed on the face of plastic scintillator, thus allowing photoelectron detection to be almost in 2π geometry. The K X-ray detector was placed at a distance of 8.8 cm from the target and at an angle of 120° with respect to the incident photon beam. The distance between the source (radioisotope) and the target was about 45 cm. The fast-slow coincidence assembly was of conventional type and permitted the detection of true photoelectric events by gating the corresponding K X-rays with the help of a single channel analyzer.

The spectrum of photoelectrons in coincidence with the K X-rays was recorded. The spectrum had a tail to its left, indicating the still unsuppressed Compton contribution. To correct for this, an auxiliary experiment was carried out with an aluminium target of almost equal dimension as that of the target foil. Aluminium was assumed as pure Compton scatterer because the contribution due to photoeffect in it is very small in the energy region of interest. From this corrected coincidence spectrum, the total number of counts under the photoelectron peak was estimated and corrected for chance coincidence rate to give the number N_K of K X-rays.

By this method, Ranganathaiah measured K-shell photoionization cross-sections in tin, tantalum, gold, lead and thorium for gamma rays from ^{85}Sr (514 keV), ^{137}Cs (662.6 keV), ^{95}Nb (765.8 keV), ^{65}Zn (1115.5 keV), ^{46}Sc (889.2

and 1120.4 keV) and ^{60}Co (1173.2 and 1332.5 keV). There was a good agreement between the theoretical results and the experimental results.

This coincidence method was employed to measure K-shell cross-sections in the case of radioisotopes

which emit more than one gamma ray of different energy such as ^{46}Sc and ^{60}Co . For the first time, Ranganathaiah has measured the K-shell photoionization cross-sections at photon energies 514, 765.8, 1115.5 and 1120.4 keV. □

used are manufactured indigenously. The lenses can be manufactured in a normal optical workshop, while the housing can be done in a general engineering workshop. The performance of this optical system is comparable with that of the imported lens and conforms to the IS:4497-1968.

The focal length of the lens is 51 mm, and its relative aperture is 1:1.6.

Most of the raw materials required for this purpose such as optical glass, aluminium, brass, and abrasives are available indigenously. Optical cement is to be imported.

The main equipment required, such as coating unit, lathe, and electroplating unit, are available indigenously. The curve generator is to be imported. However, the services of this equipment installed at CSIO can be availed of for commercial purposes. For the purpose of test and evaluation, instruments like focometer and some standard test films are required.

Some skilled workers with experience in grinding and polishing of lenses and operation of lathe are required.

The expected annual requirement in the country is 2000-3000 pieces. The capital requirement is about Rs 1 lakh and cost of production is about Rs 100 per lens.

Further details of this process (NRDC Process No.800-03-9) can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024. □

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Ceramic Colours

The Central Glass & Ceramic Research Institute (CGCRI), Calcutta, has developed technology for producing overglaze and underglaze ceramic colours covering the principal shades. The technology is economically viable for the small scale sector.

Ceramic colours are extensively required in the pottery industry to make the products decorative and attractive. The stains (pigments) which impart colour characteristics and are essential ingredients of ceramic colours also find direct use in enamel and pottery industries for making coloured enamels, coloured pottery bodies and glazes. Ceramic colours and stains valued at about Rs 20 lakh are required annually and substantial amounts of these are still being imported.

The process for producing ceramic colours developed at CGCRI consists of three steps: (i) production of stains (pigments) by calcining the batch in an oil-fired or electric furnace in the temperature range 1000°-1300°C followed by washing and fine grinding; (ii) production of overglaze and underglaze fluxes by smelting or calcining the batch in an oil-fired or electric furnace in the temperature range 1000°-1200°C; (iii) production of overglaze and underglaze ceramic colours by mixing the stains (pigments) with the respective fluxes by wet grinding (-300 mesh) followed by drying and sieving.

Manufacturing equipment like calcination furnace, ball mill and sieving accessories are indigenously available. Most of the raw materials are also

indigenously available. Some of the colouring agents like cobalt, nickel and cadmium compounds are imported items but these are easily available.

The process has been studied on a semi-commercial scale at CGCRI and the institute has so far supplied stains and ceramic colours worth Rs 3 lakh to the industry.

The suggested capacity of an economically viable unit is 50 kg of overglaze and underglaze ceramic colours of varying shades per day in one shift. Capital investment on plant and equipment of such a unit will be Rs 2 lakh and working capital Rs 3 lakh (90 days' manufacturing cost). The cost of production has been worked out on an average of Rs 85/kg depending on the colouring shades, giving a profitability of 43% without considering tax on earnings.

Further particulars can be had from the Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024. □

16 mm Cine Projection Lens

The Central Scientific Instruments Organisation (CSIO), Chandigarh, has developed some 16 mm cine projection lenses which are high aperture projection objectives useful for projecting audiovisual films in 16 mm cine projectors being manufactured in the country. These lenses are being imported so far.

The optical system is of Petzval type and consists of two widely separated, cemented doublets. The optical glasses

PCB Drilling Machine

The Central Electronics Engineering Research Institute (CEERI), Pilani, has developed a printed circuit board (PCB) drilling machine.

Printed circuit boards are used by electronics industries for assembling circuits of various instruments and equipment. The components are mounted on the printed circuit boards by inserting the leads of the components through the holes provided for this purpose and soldering the component

ends to the copper-clad side. Consequently, precision drilling of PCB holes is an important factor contributing to the quality of the assembled PCBs.

The conventional drilling machine used for making holes on the PCB operates from the top of the job. The PCB drilling machine, developed by CEERI, operates from the bottom of the PCB. This modification has the advantage that it gives burr-free holes. Other advantages of the newly designed drilling machine are that accurate positioning of the holes can be done very quickly and that time required per hole is very less compared to that in the conventional method. Consequently, it considerably reduces the fatigue of the operator.

Specifications of the PCB drilling machine developed by CEERI are:

Drilling capacity	0.5-1.5 mm diam.
Depth of drilling	6 mm
Spindle speeds	3000/6000/9000 rpm
Drilling speed	40 holes/min. in a single board (or in a 6 mm stack of PCBs with a template)

Cast iron bases (for stand), mild steel parts, gun metal bushes and electric motor are the materials and equipment needed. General engineering workshop equipment like lathe, milling machine, drill, grinding machine, power hacksaw, and hand tools are also required.

For a plant capable of manufacturing about 100 units per annum, the capital requirements would be about Rs 80,000 (Fixed capital excluding land and buildings, Rs 20,000 and working capital, Rs 60,000). The cost of production is estimated at Rs 2250 per machine. It is advantageous for an existing machine tool manufacturer to take up the production of this machine, for additional investment needed for the production of this machine is nil or is just marginal.

The tentative terms for the transfer of this know-how are: Lump sum premium, Rs 2000; Recurring royalty, nil; Period of licence, 5 yrs; and Nature of licence, non-exclusive.

Further particulars of this process (NRDC Process No.806-03-9) can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024. □

PATENTS INFORMATION

Indian Pat. 1328/Cal/76*

A process for the preparation of new yellow naphthoquinazolinone disperse dyes for polyester fibres

N.R. AYYANGAR, R.J. DESHPANDE & D.R. WAGLE
National Chemical Laboratory, Pune

This patent covers a process for the preparation of yellow naphthoquinazolinone disperse dyes such as naphtho [2',3':4,5]-quino[2,1:b]-quinazoline-5,10-dione for polyester fibres. These dyes produce bright and deep yellow dyeings on polyester fibres and have good fastness properties. □

Indian Pat. 76/Del/77*

A process for the preparation of new yellow benzanthranyl triazine disperse dyes for synthetic fibres

N.R. AYYANGAR, R.J. LAHOTI & D.R. WAGLE
National Chemical Laboratory, Pune

The National Chemical Laboratory, Pune, has developed a process for the preparation of yellow benzoanthranyl triazine disperse dyes such as 4,6-disubstituted-2-[aminobenzanthron-3'-yl]-s-triazine. These dyes produce bright yellow dyeing on polyester fibres and have excellent fastness properties. □

*Accepted

PATENTS SEALED

2760/Cal/74 (143683): An improved mobile amplitude modulated trans-receiving apparatus, P.K. Rangole & H.K. Jain—CEERI, Pilani.

2764/Cal/74 (143684): A silicon halide evaporator for obtaining constant resistivity of silicon epitaxial layer on silicon, P.D. Vyas, B.B. Dixit & K.S. Balain—CEERI, Pilani.

914/Cal/75 (143687): A new method for the production of master alloy of aluminium-magnesium, K.

Venugopalan, V. Aravamuthan, M. Kamaludeen & N.G. Ranganathan—CECRI, Karaikudi.

1842/Cal/75 (143690): A pyroelectric infrared detector, V.G. Bhide & M.M. Pradhan—NPL, New Delhi.

Erratum

In 'Patents Information' column in CN 29 (1979), 103, under Indian Pat. 1463/Cal/76 the names of the authors should be read as: S.R. Padalkar, C.S. Dorai, J. Lobo and V. Damodaran (National Chemical Laboratory, Pune). □

PERSONNEL NEWS

Appointments/Promotions

Shri D.S. Sastry

Shri D.S. Sastry, Scientist C, of the Publications and Information Directorate (PID), New Delhi, has been promoted, consequent on assessment, as Scientist E1 with effect from 1 May 1978.

Shri Sastry (born 6 Oct. 1927) obtained his M.Sc. in physics from the Andhra University in 1949. After brief stints in a few academic institutions, he worked as a Research Assistant in the Hyderabad Engineering Research Laboratories for about five years. He joined PID in 1955 on the editorial staff of *Journal of Scientific & Industrial Research* (JSIR). During 1966-68 he went on deputation as editor of *Invention Intelligence*.

Associated closely with the growth of JSIR and its offshoots, Shri Sastry took charge of *Indian Journal of Pure & Applied Physics* (IJPAP) in 1963 when it was started. Since then he has built up IJPAP to its present stature. He was intimately associated with the launching in 1972 of *Indian Journal of Radio & Space Physics*. He is presently the project leader for the physics group of journals. Among the special issues of the two physics journals, brought out under the leadership of Shri Sastry, is the Raman Effect Golden Jubilee Number of IJPAP which has won international appreciation.

Shri Sastry is also interested in the popularization of science and has published a number of popular science articles.

* * *

The following have been promoted, consequent on 5-year assessment, at the Publications & Information Directorate (PID), New Delhi:

Shri R.P. Goel (as Scientist C, 25 Nov. 1978); Shri S.S. Nathan (as Scientist C, 30 June 1978); Shri P.S. Gupta (as Scientist B, 22 April 1978); Shri R. Sambhasivan (as Scientist B, 29 May 1978); Shri V.K. Sharma (as Scientist B, 11 May 1978); Shri T.D. Nagpal (as Scientist B, 11 Nov. 1978); Dr L.M. Mathur (as Scientist A, 10 Dec. 1978; since appointed Scientist B at PID); Shri S. Balakrishnan (as Scientist A, 7 Jan. 1979; since appointed Scientist B at the Central Leather Research Institute, Madras); Shri P.S. Rawat (as Scientist A, 22 Jan. 1979); and Shri N.A. Sukhapure (as Art Officer A, 15 May 1978).

Retirements

Shri U.N. Nayak, Scientist E1, Central Glass & Ceramic Research Institute, Calcutta, retired on 30 June 1979 after 25 years of service.

Honours & Awards

Dr V.R. Singh of the National Physical Laboratory, New Delhi, has been elected the first Indian member of the International Society on Biotelemetry, University of Nijmegen, Nijmegen, The Netherlands.

* * *

Dr D.C. Goswami of the Publications and Information Directorate, New Delhi, has won a prize in the XXI National Prize Competition for Children's Literature for his book 'Manuh aru Mahakash' (Man and Space) in Assamese. Awarded by the National Council of Educational Research and Training, New Delhi, the prize carries a cash of Rs 3000.

Dr Goswami who has widely contributed to the cause of popularization of science, is a contributing Associate Editor of *Bijnan Jeuti*, a popular science bimonthly in Assamese, published by the Assam Science Society, Gauhati, which is also the publisher of the prizewinning book.

* * *

Shri S.D. Khangar, Shri S.S. Nawlakhe and Shri Bhagwan Singh Negi of the National Environmental Engineering Research Institute, Nagpur, have been awarded (i) Sangram Medal, and (ii)

25th Independence Anniversary Medal: 1947-1972 in recognition of their services during the Bangla Desh conflict in 1971-72 as members of the 118 INF BN (TA), Nagpur. □

PTC at Lucknow

A new CSIR Polytechnology Transfer Centre (PTC) has started functioning at Lucknow from 16 June 1979. Interested parties may contact: The Project Officer, CSIR Polytechnology Transfer Centre, 121 Jawahar Bhawan, 18 Ashok Marg, Lucknow 226001. □

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 14/79

It is proposed to appoint a Scientist F (Deputy Director) in the Central Drug Research Institute, Lucknow.

Job requirement: The candidate is required to provide high level leadership for the overall planning and execution of multi-disciplinary research and development programmes in the field of drugs both of natural and synthetic origin. He will have to coordinate the work of the medicinal chemistry discipline with that of biomedical disciplines in the institute and also maintain liaison with other research organizations in the area.

Qualifications: The candidate should possess high academic qualifications in organic or pharmaceutical chemistry with at least 15 years' research experience in the field of natural products and synthetic chemistry with special reference to drugs. He should have proven ability in the guiding and management of research.

Salary/Conditions of Service: The salary scale attached to the post is Rs 2000—125/2—2500. Initial pay will be fixed according to merit. Qualifications and experience are relaxable in the case of candidates otherwise found suitable for the post. The post is purely temporary for a period of about 3 years. The services of the selected candidate could be terminated even earlier in case the regular incumbent of the post, who is at present on deputation abroad, reverts back to this post.

Age Limit: Below 50 years relaxable in special cases.

Scientists/technologists interested may obtain two copies of the standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific and Industrial Research, Rafi Marg, New Delhi 110001 on or before 25 August 1979. They can also obtain a brochure on the aims and objects and latest annual report of the laboratory. Completed *curriculum vitae* proformae must be received in this office on or before 22 September 1979.

Canvassing in any form and/or bringing in any influence, political or otherwise, will be treated as a disqualification for the post.

* * *

Recruitment to the Scientists' Pool

1. Applications are invited for the next bulk selection to the Scientists' Pool from persons with outstanding academic qualifications. Candidates should normally possess doctorate degree in science, technology, social science or humanities, or a master's degree in engineering or medicine.

2. The Pool offers the following facilities:

(a) Assignment in an appropriate institution.

(b) A fixed salary between Rs 700 and Rs 1300 per month plus allowances; higher salaries may be paid in exceptional cases.

(c) Freedom to apply for positions (under the Government or in the private or public sectors) and to leave the pool at short notice.

3. Pool placement is not regular appointment, but is in the nature of a facility to enable well qualified persons to work while looking for regular positions. The temporary placement in the Pool is generally for a period of one year or two.

4. Application forms can be obtained from the Scientist in charge, Division for Scientific and Technical Personnel, Council of Scientific and Industrial Research, CSIR Complex, NPL Campus, New Delhi 110012. Completed forms should reach the address latest by the 7 September 1979.

CSIR NEWS

A SEMI-MONTHLY HOUSE BULLETIN OF CSIR

VOL 29 NO 17 15 SEPTEMBER 1979

CSIR Society Reconstituted

The Society of the Council of Scientific and Industrial Research has been reconstituted for a period of two years ending with 9 August 1981 and consists of the following:

President

Prime Minister

Vice President

Shri K.C. Pant
Minister of Energy, New Delhi

Members

Chairman

National Committee on Science & Technology, New Delhi

Dr M.S. Swaminathan, FRS

Secretary, Department of Agriculture and Rural Development, Krishi Bhavan, Dr Rajendra Prasad Road, New Delhi

Dr Bharat Ram

Managing Director, Delhi Cloth & General Mills Co. Ltd, Delhi

Shri M. Varadarajan

Chairman, Indian Detonators Ltd, Hyderabad

Dr O.P. Jain

Director, Indian Institute of Technology, New Delhi

Prof. A.K. Saha

Saha Institute of Nuclear Physics, Calcutta

Dr Anil Sadgopal

Scientist, Kishore Bharati, P.O.

Malahanwada, Via Bankheri, Hoshangabad

Shri Kan. D. Mariwala

Chairman & Managing Director, National Industrial Development Corporation, New Delhi

The following members of the Governing Body of the CSIR are also members of the Society (CSIR) for the period for which they are members of the Governing Body:

Director General

Scientific and Industrial Research, Rafi Marg, New Delhi (Chairman, Governing Body)

Nominee of the Ministry of Finance, Government of India (Shri G. Ramachandran, Finance Secretary)

Dr S. Varadarajan

Chairman-cum-Managing Director, Indian Petrochemicals Corporation Limited, Jawaharnagar, Baroda

Dr B. Ramachandra Rao

Vice Chairman, University Grants Commission, Bahadurshah Zafar Marg, New Delhi

Prof. A.K. Sharma

Calcutta University, 35 Balliganj Circular Road, Calcutta

Chairmen of the following Coordination Councils:

(i) Chemical Sciences Group

(Dr H.V.K. Udupa, Director, Central

Electrochemical Research Institute, Karaikudi) (up to 30 September 1980)

(ii) Physical & Earth Sciences Group (Dr Harsh Vardhan, Director, Central Scientific Instruments Organisation, Chandigarh) (up to 12 May 1980)

(iii) Engineering Sciences Group (Shri K.D. Sharma, Director, Central Glass & Ceramic Research Institute, Calcutta) (up to 31 July 1980)

(iv) Biological Sciences Group (Dr Nitya Anand, Director, Central Drug Research Institute, Lucknow) (up to 17 January 1981) □

Management of R&D Institutions

A workshop on management of R&D institutions of food science and technology, sponsored by the United Nations University (UNU), was held at the Central Food Technological Research Institute (CFTRI), Mysore, during 17-21 July 1979. At the workshop, scientists shared their experience in management in developing countries through presentation of case studies. Twenty-eight participants and

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11 observers, including heads of food R&D institutions and experts in futurology, budgeting and costing, communication and information, and staff problems, from 16 countries or international agencies attended the workshop, which was followed by visits by the delegates to food-processing units in Bangalore and Bombay.

The workshop, which was organized in eleven sessions, was inaugurated by Prof. K.S. Hegde, Vice Chancellor, Mysore University. The first session discussed the theme and goals of the workshop as exemplified by the CFTRI management pattern. At the second session, it emerged that post-harvest food technology was greatly influenced by pre-harvest operations, besides certain areas of actual overlap. The nature and types of R&D institutions discussed in the next session ranged from totally contract-based institutions, as exemplified by the one in Korea, to totally government-dependant ones, as in Bangladesh, each with its own management problems. Mexico has as yet no specialized R&D institution in the area of food, but submitted a planning exercise—a detailed analysis of the existing situation, and a proposal for the type of organization needed, its structure, areas of proposed R&D activity, and the forward planning required.

In the choice and handling of problems, both immediate and long range, an important consideration was the criteria for balancing basic with applied work. Experience showed that a mix was inescapable: sometimes basic work was required for handling an applied problem, at other times the applied problem could be pursued and the basic work could grow out of it. Criteria for problem identification were discussed through actual case studies drawn from experiences in India, Thailand and other countries, while the factors influencing future problem forecasting were also reviewed.

A vital task of R&D management is to effect the transfer of finished technologies to actual production. Case

studies were reported from Nigeria and UK, while India's experience of technology transfer through the agency of the National Research Development Corporation of India, a public sector body, was also presented. The outward reach and impact of CFTRI itself was presented in terms of industrial impact indices like extent of process transfer and of sponsored research, feasibility and techno-economic surveys, technical consultancy, pattern of research papers, documentation, means of academic interaction and media of mass communication. In developing and transferring technologies, there is a growing awareness that the social, human and environmental factors, though difficult to quantify in monetary terms, need attention.

Management of information and knowledge by the use of modern tools is an integral part of R&D management. The system followed by CFTRI in this respect, it was felt, could perhaps be useful for other developing countries.

In regard to project costing, the general feeling was that excessive attention to detail might yield perfect account sheets, but not necessarily scientific progress. A certain degree of flexibility was usually desirable, and the systems should provide for chance curiosity of the scientist.

The workshop concluded with a panel discussion at which 14 participants analyzed various matters relating to the management of staff.

The proceedings of the workshop are being processed for publication. □

NCL-EIL Agreement on Developing Packing Material for Unit Operations

The National Chemical Laboratory (NCL), Pune, has executed, on behalf of the Council of Scientific and Industrial Research, an agreement with the Engineers India Ltd (EIL), New Delhi, for developing packing material used in unit operations, such as distillation and

absorption, encountered in chemical industry. These packings are expected to be far superior in performance to the existing packings.

The desired characteristics of packings are as low a pressure drop per unit length as possible and as high a mass transfer efficiency as possible. The laboratory will investigate the performance of such novel packings of indigenous designs in a fully automated pilot scale distillation column set up specifically for this project. □

Photoelectron Spectrometer Commissioned at NCL

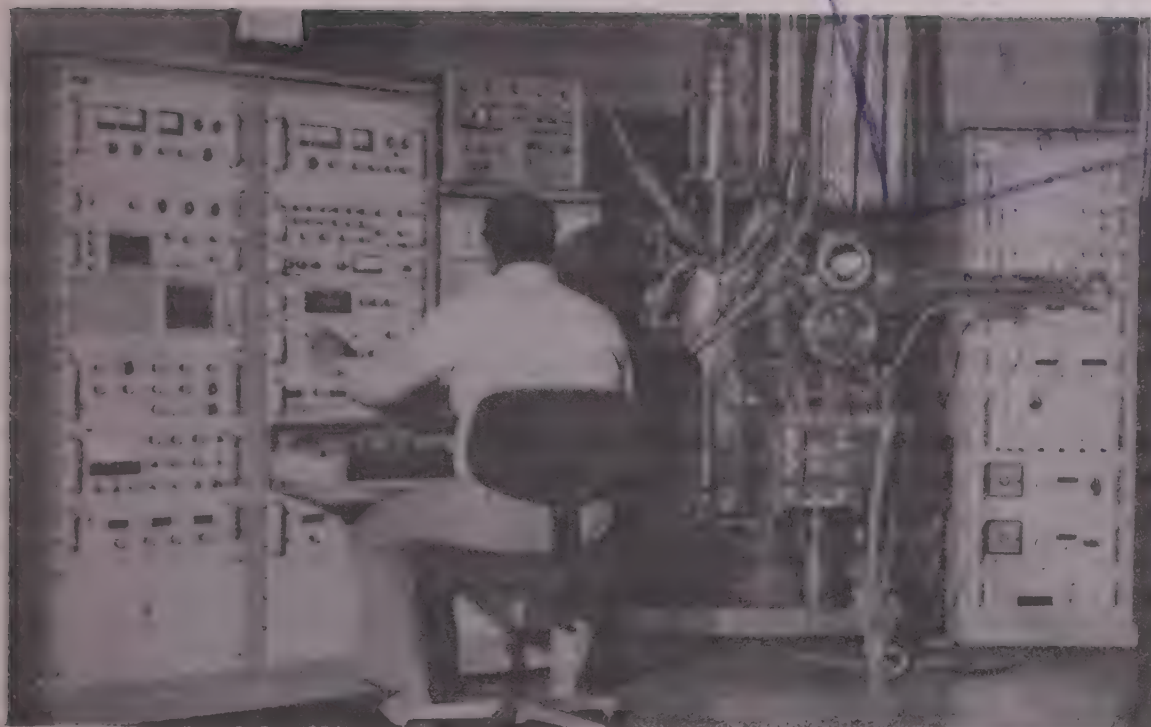
A photoelectron spectrometer has been commissioned recently at the National Chemical Laboratory (NCL), Pune.

Although of a very recent origin, the technique of electron spectroscopy has developed into a powerful research tool, particularly for studying surface phenomena which were so far almost inaccessible to any meaningful experimental study. The first of its kind to be installed in any CSIR laboratory, the instrument (type, ESCA-3 MK II; obtained from Vacuum Generators Ltd, UK) has the following capabilities:

X-ray and UV photoelectron spectroscopy (XPS and UPS): The XPS and UPS are the most reliable techniques for the experimental determination of the electronic energy levels. Since the escape depth of electrons is around 10 Å, these techniques truly measure the energy levels of atoms on the surface or at most a few atomic layers beneath.

The UPS offers a better resolution and is more sensitive to the low-lying energy levels, whereas the XPS is useful for deeper electrons which cannot be ejected by UV photons.

These techniques find direct applications in (i) experimental determination of energy levels and density of states, (ii) identification and estimation of phases, viz. their characteristic energy levels, and (iii) understanding of processes like chemisorption, catalysis, catalytic poisoning, and corrosion by studying the changes in the energy



The photoelectron spectrometer commissioned at NCL, Pune

levels. A feature which has increased the applicability of these techniques for chemists is the existence of chemical shift in the photoelectron spectrum.

Electron-initiated Auger electron spectroscopy (AES): The relatively high signal-to-noise ratio in AES allows rapid analysis and permits a variety of dynamic effects to be monitored. As the sensitivity of AES to the various elements is relatively constant (varying by less than one order of magnitude over elements from Li to Th), this technique is better suited for quantitative chemical analysis (typical detection limit 10^{12} atoms/cm², 0.1% atomic concentration).

Scanning Auger (SAM)—physical and chemical mapping of surface: A finely focussed electron beam is made to scan the surface of the specimen and the emitted Auger electrons are analyzed to characterize the element. A complete elemental distribution along a chosen line on the sample can be obtained quantitatively (line scan). Alternatively, a particular element may be selected and the instrument may be monitored to plot its concentration distribution over the entire area (2-D chemical mapping). This process can be repeated for all the elements one is looking for one after another. Physical (topographical) maps can also be produced similarly by

analyzing the secondary electrons. The instrument has a spatial resolution of 5 μ m in both chemical and physical mapping.

Depth profiling: The changes in Auger signal amplitude can be monitored, as the surface is sputter-etched, to provide an automatic plot of composition versus depth. Also, SAM analysis can be carried out layer by layer and thus a complete 3-D chemical and physical map of any sample can be obtained (with a resolution of about 5 μ m laterally and 10 Å along the depth).

Secondary ion mass spectrometry (SIMS): This is inherently a very sensitive technique for detection and analysis of trace elements present on surfaces (detection limit approx. 10^9 atoms/cm², i.e. a millionth of a monolayer). Hydrogen and helium can be observed as also the individual isotopes of elements. Peak identification in SIMS can sometimes be difficult and also matrix effects cause some variation, but when used in conjunction with the other techniques mentioned above, this can be a powerful tool. □

Methane Telemonitoring System

The Central Mining Research Station (CMRS), Dhanbad, has developed, in

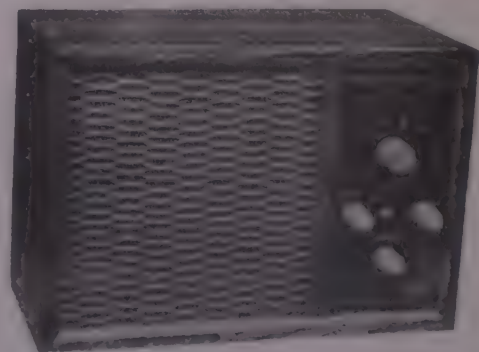
collaboration with Bharat Bijlee Limited, Bombay, a single-point methane telemonitoring system for continuous surveillance of methane build-up in the underground atmosphere.

The system consists of two sets of assemblies. One set is placed underground for sensing methane and transmitting signal continuously to a surface station through cables. The other, installed in the surface station, receives and records the conditions of the underground air continuously and relays information for operating the alarm and power cut-off.

Installed at Sudamdih and Moonidih coalmines of BCCL, this device has been functioning satisfactorily for the past two years. A multi-point system—a modified version of the CMRS-developed single point system—will be installed at Jamadoba coalmine of TISCO. This version is capable of monitoring the methane concentration of several strategic underground locations simultaneously.

Electronic Tala Generator

The Madras Extension Centre of the Central Electronics Engineering Research Institute (CEERI), Pilani, has developed an electronic *tala* (time reference) generator which helps a (music) student get self-trained in *tala*. Portable, compact (2 kg; 18 × 18 × 2 cm³) and simple in operation, the device, which is fabricated with digital integrated circuits, gives a periodic and steady time reference based on which the student can practise four *talas* with adjustable speeds from 0.3 s to 3.0 s. It



The *tala* generator developed by CEERI's Madras Extension Centre

gives normal and double *kalai* nodes with variable tone. It gives visual LED display in four colours. The instrument can also be used to provide basic *shruti*.

Designed under a sponsored project by Dr P.E. Sankaranarayanan of CEERI's Madras Extension Centre, the instrument has now been improved upon on suggestions from experts in music. A prototype of the instrument has been handed over to the sponsor, Unique Electronics, Madras.

The generator (cost, Rs 970) won an award at the Small Scale Industrial Exhibition held at Madras in June 1979. □

Nitride-Oxynitride Bonded Silicon Carbide

The Central Glass & Ceramic Research Institute (CGCRI), Calcutta, has developed nitride-oxynitride bonded silicon carbide.

Silicon carbide refractories are widely used as bricks, tiles, crucibles, kiln furniture, muffles, recuperator tubes, etc. in metallurgical, ceramic and other industries. Such refractories, produced in India, have an alumino-silicate or alkaline earth silicate bond. The high-temperature mechanical properties, thermal shock resistance and corrosion resistance of these refractories depend to a large extent on the nature of the binding material. The nitride-oxynitride bonded silicon carbide are superior to other conventional silicon carbide refractories. The properties of nitride-oxynitride bonded silicon carbide product developed at CGCRI are as follows:

Density	2.3 g/cc (approx.)
Porosity	23-29%
Modulus of rupture	6,040 psi at room temp. 7,273 psi at 1250°C 9,669 psi at 1350°C 10,522 psi at 1400°C
Thermal shock	No spalling up to 20 thermal cycles from 1250°C to room temp.
Oxidation	Resistant to oxidation. Total weight gain at 1350°C and in ambient atm., 4.7 mg/cm ²

Thermal expansion	$3.7 \times 10^{-6}/^{\circ}\text{C}$ (0-1400°C)
Corrosion resistance	No attack by molten aluminium for 6 days at 800°C. No attack by copper at 1150°C on submerged surface. Necking at air metal interface after 24 hr
Fluoride bath	No attack up to 30 hr at 950°C in cryolite (85%)-AlF ₃ (6%)-CaF ₂ (6%)-Al ₂ O ₃ (3%) bath. Slow dissolution in blast furnace slag at 1450°C

CSIR's EXTRAMURAL RESEARCH Light Scattering Type Particle Counter

Under a CSIR-supported research scheme granted to them (Jan. 1976 to Dec. 1978), Prof. Narendra Nath, Head of Physics Department, Kurukshetra University, Kurukshetra, and coworkers have designed and fabricated, in collaboration with the Central Scientific Instruments Organisation, Chandigarh, a light scattering type particle counter for monitoring clean room environment in the range class 100-1,00,000. An instrument of this kind is essential for obtaining data on average concentration and size of airborne particulate matter which in turn are required for making a particular manufacturing process, involving microelectronic components, precision mechanical components, or pharmaceutical works, reliable and of reasonable yield.

In the prototype instrument developed, the general design of ROYCO Model 245 particle counter, manufactured by ROYCO, USA, has been followed. In this set-up, light emitted from a stabilized source, which is a 6V, 30 W microscopic lamp (Olympus LSD model), is condensed into a point known as sensitive volume. This volume should be as small as possible. In the model developed at the Kurukshetra University, the dimension of the sensitive volume is approximately 4 mm³. Through this volume, air from

clean room environment under study is drawn with the help of a carefully designed jet assembly at a uniform rate. Any particle present in the sensitive volume scatters light in all directions. The diffracted component of a light is guided on to a photomultiplier tube, which when combined with an amplifier system, gives rise to a detectable pulse, proportional to the dimension of the particle.

The instrument designed by Prof. Narendra Nath's team is probably the first of its kind in the country in the sense that it is responding to particles in clean rooms, although of relatively larger dimensions. This has been checked by taking photographs of the output of the amplifier on a storage oscilloscope. Because a standard aerosol generator was not available it was not possible to calibrate the instrument properly, but an indirect method of calibration shows that the system probably responds to particles above 5 μm in dimension. The prototype instrument has also helped identify major practical problems associated with the design of such instruments.

The co-investigators associated with the project are: Dr A.P. Sharma, Dr V.K. Mathur and Dr S.K. Chattopadhyaya, Readers in the Physics Department of the university. Shri Chatar Singh, a junior research fellow, was also associated with the project. □

Isolation of Agarose from Commercial Agar

Under a CSIR research scheme (Feb. 1975 to Feb. 1978) granted to him, Dr N.R. Kale of the Department of Chemistry, University of Poona, Pune, has developed a simple procedure for the preparation of agarose from commercial agar (Indian and Japanese). In the process, acid polysaccharides are removed by extracting the agar gel granules with phosphate buffer (0.03 M, pH 6.8) containing urea (4M) followed by electrophoresis in the same buffer system. An alkali treatment in the

presence of sodium borohydride gave essentially a neutral agarose, as judged by the electrophoretic behaviour of basic substances like Crystal Violet and Cytochrome C. The purified agarose, with yields of 60-65%, had a sulphur content of less than 0.1%, and formed rigid, transparent gels. It was suitable for electrophoresis, gel filtration, immunodiffusion, affinity chromatography and gel-linked enzymes.

The agarose was converted to spherical beads which were made thermostable by cross-linking with epichlorohydrin.

Miss Shobhana S. Chitale (Mrs S.S. Gadgil), Mrs Meena S. Karve and Shri S.V. Munjal were the research fellows who worked in the project. □

Cable Stayed Bridges: Static and Dynamic Behaviour

In a CSIR-supported research scheme, Dr A.S. Arya, Professor and Head, School of Research and Training in Earthquake Engineering, and Dr Prem Krishna, Professor of Civil Engineering, University of Roorkee, Roorkee, undertook a study (July 1975-July 1978) on cable-stayed bridges.

Cable-stayed bridges are structural systems in which inclined cables emanate from one or more points of supporting towers and hold large-span stiffening girders of the bridge deck at intermediate locations between the main supports. Modern cable-stayed bridges are found to fulfil the engineering requirement of optimum structural use of materials involved in their construction for a span range of 90-370 m. These bridges possess an aesthetical appeal.

A wide acceptance of the concept of the cable-stayed bridge has faced organizational as well as technological problems in the past. The present study aimed at advancing the understanding about the analysis procedure and the static and dynamic behaviour of such bridges through investigation of the influence of certain important parameters and experimental verification of

the analytical results.

The study has shown that the three-span system is appreciably more flexible than the five-span system. The axial-flexural interaction increases the overall flexibility of the system. The increase is within 10% for the five-span system, but in the axial forces in the main girder elements it is significant.

The mutual sharing of eccentric vertical loads by the main girders is moderate as seen from the study of the bridge under vertical loads applied to one of the main girders. The forces and deformations in the unloaded side lie generally between 10 and 25% of those on the loaded side. Other effects of eccentric loading are the horizontal bending and twisting of the deck near the centre of the main span which must be considered in the design.

Under the action of lateral forces, the deck tends to act as a horizontal girder with cables carrying only negligible axial forces. Axial forces and moments in the main girder elements are significantly affected by the ratio of the

side span to the centre span. The ratio of tower height to centre span has a significant effect on the twisting and horizontal bending of the main girders and axial forces, shears and moments in the tower and the substructure. The ratio of cable stiffness to girder torsional stiffness affects the horizontal bending and twisting of tower legs. An increase in the width of deck decreases the horizontal bending of the deck.

The effect of soil-structure interaction, even when soil is soft, is negligible on the superstructure forces, but the substructure forces are significantly increased.

Most of the lower modes of free vibration are characterized by the deflections of the deck in the vertical plane. Experimentally, it does not appear possible to induce a pure mode in the superstructure owing to cable vibrations.

The comparison of analytical and experimental results is generally good and this proves the adequacy of the analyses adopted. □

PROCESS AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Benzylamine

The Central Electrochemical Research Institute (CECRI), Karaikudi, has developed a process for the production of benzylamine.

Benzylamine is a drug intermediate used for the preparation of active organic principles. It is also employed as an efficient corrosion inhibitor and a brightener in plating baths. Benzylamine is not known to be produced in the country and hence its use is limited.

The CECRI process consists in the reduction of benzonitrile in a supporting electrolyte using a stationary deposited nickel black-over-graphite cathode in a divided cell. At the end of electrolysis the catholyte is distilled to recover rectified spirit. After the removal of unreduced benzonitrile, the residue is neutralized to liberate

benzylamine. The amine is purified by distillation.

The process has been studied in a 75 A cell capable of producing 220 g of benzylamine per batch of 8 hr.

The main raw materials required in the process are: benzonitrile, sulphuric acid, sodium hydroxide, rectified spirit, nickel sulphate and ammonium sulphate. All these are available in the country.

The plant and machinery required are: rectifier, electrolytic cell with cathode and anode, refrigeration unit, neutralization tank, steam boiler, distillation column and storage tanks.

The capacity of an economically viable unit for producing benzylamine is 30 tonnes per annum. It is estimated that the total investment required to put up such a plant will be Rs 16.6 lakh. The breakup of investment is as: fixed

capital on land and building, Rs 1,20,000; fixed capital on plant, Rs 5,13,000; working capital, Rs 8,99,700; preliminary and pre-operative expenses, Rs 1,00,000; and know-how fee, Rs 25,000. The cost of production has been worked out to be Rs 130/kg.

Further particulars regarding this process (NRDC Process No. 796-12-8) can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024. □

Lead-Free White and Coloured Enamel for Aluminium Metal

The Central Glass & Ceramic Research Institute (CGCRI), Calcutta, has developed lead-free white and transparent base enamel compositions suitable for application on aluminium metal. The transparent base enamel can be used for all types of coloured coatings. The enamels mature at lower temperatures, in the range 540-550°C. Aluminium enamels can be used in the building industry, and owing to their non-toxic nature, they are useful for household utensils. Vitreous enamel coatings on aluminium can be widely used in architectural panels, curtain walls, sun-breakers, internal finishing of boats, ships and aircrafts, etc. with additional advantages of its light weight and higher corrosion resistance characteristics.

The application of vitreous enamel coatings on aluminium has good potential in India. The process can be taken up by parties engaged in commercial production of enamel fruits without any additional investment on plant and machinery.

The process has been developed on laboratory scale with 5 kg batch smelting. It is similar to that of conventional sheet iron enamels, and consists of: (i) making the raw materials in suitable proportions, and (ii) smelting the batch in oil-fired crucible furnace at 1050°C, followed by quenching in water.

The equipment required are: oil-fired crucible furnace, sieving and mixing accessories, weighing balance, etc. All these are indigenously available.

The suggested capacity of an economically viable plant is 50 kg of enamel frit per day (one shift). The land required for storage of raw materials is 1000 ft² and that for plant and building, 4500 ft². Fixed capital required on building would be Rs 50,000 and on plant/workshop, Rs 76,700. Working capital is estimated at Rs 1.5 lakh (for 90 days).

Further particulars of this process (NRDC Process No. 810-04-9) can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024. □

Synthetic Inorganic Green Pigment

This is used as an ingredient in paints for exterior and interior decoration, and can also be used in belt polishes. A new product based on iron oxide, this pigment is expected to have the same consumption pattern as that of chrome green, and is less expensive and non-toxic.

The Regional Research Laboratory (RRL), Bhubaneswar, has developed a process for preparing synthetic inorganic green pigment. The process consists in the dispersion of iron oxide yellow in water. The slurry thus formed is mixed with ferrous sulphate solution, sulphuric acid and potassium ferrocyanide solution. The contents are stirred with air being bubbled into the solution. The green precipitate thus formed is filtered, washed, dried and powdered.

The process has been studied on 0.5 kg per batch scale.

The main raw materials required in the process are: iron oxide yellow, ferrous sulphate heptahydrate/pickle liquor, potassium ferrocyanide and sulphuric acid. All these are available in the country.

The major items of equipment are:

dissolution tanks with stirrers, reaction vessel, air compressor, filter press, oven, hammer mill, stirrer with stand, etc. All these are available indigenously.

The suggested capacity of an economic unit for the industry is 16 tonnes of the pigment per annum. It is estimated that an investment of about Rs 1.66 lakh will be required to put up such a unit (fixed capital on building, Rs 40,000; fixed capital on plant, Rs 83,000; and working capital Rs 43,000). The cost of production has been worked out to be Rs 13.60 per kg.

Further particulars regarding this patent (NRDC Process No. 812-05-9) can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi-110024. □

Metol

The Central Drug Research Institute (CDRI), Lucknow, has developed a process for making metol (*p*-N-methyl aminophenolsulphate). In the process, *p*-aminophenol is reacted with monochloroacetic acid to give *p*-hydroxyphenylglycine, which is decarboxylated to *p*-methylaminophenol. This is converted to metol. The chemical has been prepared in the laboratory on 1 kg batch scale.

Metol is used as a photographic developer and in dyeing furs. Its present demand of about 10 tonnes/annum is met mainly by imports. The future demand for metol is estimated at 60 tonnes/annum.

Metol is a white or cream coloured crystalline powder becoming darker on exposure to air. It is slightly soluble in water, and ash is not more than 0.1%.

The product developed by the laboratory has been tested and found suitable in all respects.

The main raw materials required are: *p*-aminophenol, monochloroacetic acid, cyclohexanone and isopropanol. All these are available indigenously. The main items of machinery required are: reactor (steam-jacketed, glass-lined), centrifuge, fractional distillation unit,

industrial vacuum pump, hot air drier, and crystallizer. All these are available in the country.

The optimum capacity of an economically viable plant is estimated at 3 tonnes of metol per annum. The land requirements for plant and storage of raw materials will be 800 ft² and 2200 ft² respectively. The capital outlay for the unit is: building, Rs 24,000; plant, Rs 2,33,000; and working capital, 1,35,000. The cost of production is estimated at Rs 150/kg.

Further particulars regarding this process (NRDC Process No. 793-10-8) can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024. □

PERSONNEL NEWS

Appointments/Promotions

Shri A.K. Seth has been appointed Scientist in charge of the Jaipur Zonal Laboratory of the National Environmental Engineering Research Institute, Nagpur (5 July 1979).

* * *

Shri D.S. Verma of the Publications and Information Directorate, New Delhi, has been promoted, on assessment, as Art Officer (A) (20 June 1975).

Honours

Dr D.S. Bhakuni

Dr Dewan S. Bhakuni of the Central Drug Research Institute (CDRI), Lucknow, has been awarded the degree of Doctor of Science by the University of London for his contributions to the chemistry of alkaloids. An account of Dr Bhakuni's contributions follows.

Dr Bhakuni has been engaged in the structure determination, synthesis and biosynthesis of the alkaloids of Indian plants. He has isolated several aporphine and proaporphine alkaloids from *Croton sparsiflorus* and established their structures, stereochemistry and absolute configuration. He has studied the biosynthesis of crotsparine, crotsparinine, and sparsiflorine and found

potent hypotensive activity in N-methylcrotsparine.

Dr Bhakuni has isolated aporphine alkaloids, which show anticancer activity from the leaves of *Annona squamosa* and from the leaves and stems of *Litsea glutinosa*, *L. sebifera*, *L. wightiana* and *Actinodaphne obovata*. Some of these alkaloids are of biological interest while others have biogenetic significance. Dr Bhakuni has proved through tracer experiments that dopa contributes only to the formation of the phenylethylamine portion of reticuline in *L. glutinosa* and that the benzylic portion is biosynthesized from 3,4-dihydroxyphenylpyruvic acid not derived from dopa.

He has studied the biosynthesis of the proaporphine alkaloid crotonosine and the abnormal aporphine alkaloids roemerine, anonaine and mecambaine.

Dr Bhakuni has isolated a new peptide alkaloid, crenatine A., from *Discaria crenata* and established its structure.

Dr Bhakuni has isolated tetrahydroberberine type of alkaloids from *Dicentra macrocarpos*, *Corydalis cornuta* and *C. govaniana*. The structures of the unusual indole alkaloids aristoteline and aristotelone from *Aristolelia chilensis* have been elucidated by him.

From *Cocculus pendulus* bisbenzylisoquinoline alkaloids have been obtained by Dr Bhakuni; of these, pendulin has hypotensive activity and cocsulinin is active in tissue culture against human carcinoma of the nasopharynx. The structure and stereochemistry of the alkaloids isolated have been determined.

A new group of alkaloids, now named as 'abnormal Erythrina alkaloids' and also dibenz[*d,f*]azonine alkaloids have been isolated from *Cocculus laurifolius*. By means of tracer experiments Dr Bhakuni showed that isococculidine, cocculidine and cocculine are biosynthesized from (+)-norproto-sinomenine.

Dr Bhakuni has shown that papaverine, an alkaloid of *Papaver somniferum* and used as an antispasmodic drug, is derived from (—)-nor-reticuline via norlaudininine and norlaudanosine.

By means of feeding experiments Dr Bhakuni demonstrated that nor-reticuline and reticuline are efficiently and specifically incorporated into boldine, but not (+)-norprotosinomenine and nor-orientaline, and that stereospecificity is maintained in the bioconversion of 1-benzylisoquinoline precursors into boldine. The specific utilization of reticuline by *C. laurifolius* to form sebriferine, a morphinandienone alkaloid, has also been shown. Parallel feeding of (R)- and (S)-reticulines showed that stereospecificity is not maintained in the biosynthesis of sebriferine.

Dr Bhakuni has established that the *Tiliacora cracemosa* alkaloids tiliageine and tiliacorine have 'S' and 'R' configurations at the asymmetric centres C₁ and C₁' respectively and that tiliacoronine has the 'S' configuration at both the asymmetric centres. Both these dimeric bases have been shown to be biosynthesized from N-methylcocclaurine.

Another important observation of Dr Bhakuni is that the bisbenzylisoquinoline alkaloids, cocsulin and cocsulinin, are formed in *C. laurifolius* by oxidative dimerization of (+)-(S)-N-methylcocclaurine.

Dr Bhakuni has shown by parallel feeding of (+)-(S)- and (—)-(R)-N-methylcocclaurine that both enantiomers are specially incorporated into oxyacanthine, and has ruled out the possibility of interconversion of the two enantiomers via the didehydro-N-methylcocclaurine intermediate since the hydrogen atom at the asymmetric C₁ in N-methylcocclaurine is retained in the biosynthesis of oxyacanthine.

INSA Young Scientists Award to Dr O.K. Kaul

Dr Opendar Krishan Kaul of the Regional Research Laboratory, Jammu, has been awarded the 1979 Young Scientists Award of the Indian National Science Academy (INSA). The award comprises a medal, cash prize of Rs 1500 and a research grant of Rs 5000 from the

Kothari Scientific and Research Institute, Calcutta.

Dr Kaul worked on regulation of insect reproduction by nontoxic steriliants under the guidance of Dr C.K. Atal and Shri B.P. Sexana. His outstanding contribution lies in establishing a new concept in hormonal interplay in the reproductive mechanism of insects vis-a-vis insect control. His studies in chemosterilization effects of some nontoxic plant isolates have opened up new vistas in the field of insect control.

Dr Kaul has 40 research papers and two review articles to his credit.



Dr B.B. Sundaresan, Director, NEERI, Nagpur, has been nominated a member of the editorial board of the Environmental Sanitation Information Centre of the Asian Institute of Technology, Bangkok.

Dr S.K. Mukherjee of the Central Drug Research Institute, Lucknow, has been elected a Fellow of the All-India Institute of Diabetes, Bombay.

Obituary

Dr B. Mukerji

We record with deep regret the passing away, at Calcutta, on 30 July 1979, of Dr B. Mukerji, former Director (1951-63) of the Central Drug Research Institute (CDRI), Lucknow.

A condolence meeting was held at CDRI on 31 July at which rich tributes were paid to the late Dr Mukerji by the members of staff. The laboratory closed for the day as a mark of respect to the late Dr Mukerji.

We record with deep regret the passing away, on 25 July 1979, of Shri Kedar Ram, 54, Senior Technical Assistant, Division of Scientific and Technical Personnel, CSIR Complex, New Delhi.

PATENTS FILED

317/Del/79: A process for the isolation of pure Neuraminidase from *Vibrio cholerae*, D. Thambidorai, P.K. Chanda, M. Maiti & B.K. Bachhawat—IEM, Calcutta.

341/Del/79: Improvement in or relating to the production of dinitrosopentamethylenetetramine (DPT) from liquor ammonia, aqueous formaldehyde, sodium nitrite and ammonium sulphate, V.N. Gupta, J.N. Baruah—RRL, Jorhat; K.W. Gopinath—Ranbaxy Laboratories, New Delhi; and M.S. Iyengar—New Delhi. □

CDRI Seeks Collaboration with Firms

The Central Drug Research Institute (CDRI), Lucknow, has developed seven drugs which are in various stages of clinical trial. These drugs, with codes for five of them in parenthesis, are: (1) Centbucridine (65/124)—local anaesthetic; (2) Centazolone (65/469)—tranquilisedative; (3) Centchroman (67/20)—oral contraceptive; (4) Centperazine (65/255)—antifilarial; (5) Centpropazine (67/14)—

antidipressant; (6) Curcumin (from *Curcuma longa*)—anti-inflammatory; and (7) Consap cream—local contraceptive. The first two drugs are in phase III clinical trial, the next four are in phase II, clinical trial, and the last is in phase I clinical trial.

The laboratory invites enquiries from firms interested in collaborating with it on further developmental work for introducing these drugs in Indian and foreign markets, the terms and conditions being negotiable. Firms interested in collaborating with CDRI may address their enquiries to the Director, Central Drug Research Institute, Lucknow 226001, giving details of their product range, annual turnover (latest), R & D facilities, and experience in promoting new drugs in India and abroad. □

Coordination Council for Biological Sciences

The Centre for Cellular and Molecular Biology at the Regional Research Laboratory, Hyderabad, has been included in the Coordination Council for the Biological Sciences Group. □

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

CSIR RESEARCH ASSOCIATESHIP

Advertisement No. EMR/RA/2/79

It is proposed to award 25 Research Associateships in science and engineering subjects. A person possessing minimum Ph.D. or equivalent degree, or having at least three years' research, design and development experience after M. Tech. in engineering/technology and with less than 35 years in age at the time of applying, will be eligible to apply. Persons with proven research/design/development capability will be considered for the award. The selected Research Associates will get consolidated amount in the range of Rs 1000 to Rs 1400 p.m. fixed for a period not exceeding three years. Form for application may be had from the Under Secretary, Extramural Research Division, Council of Scientific & Industrial Research, New Delhi 110001. Request for application form must be accompanied by (a) a self-addressed stamped (85 paise) envelope of the size of 15 × 25 cm² and (b) a crossed Indian Postal Order for Rs 2 (0.50 paise for Scheduled Castes and Tribes) drawn in favour of Chief (Administration), Council of Scientific & Industrial Research and payable at New Delhi Post Office. The envelope containing the request for form must be superscribed 'Application form for Research Associateship'. Request for application forms must be made on or before 18 September 1979. Complete application forms duly sponsored by the authorities of institutes/universities/research laboratories (where the candidates propose to undertake research) along with copies of research papers, attested true copies of all relevant certificates and testimonials and mark sheets (originals should not be sent unless asked for), and Indian Postal Order for Rs 8 (for Scheduled Castes/Tribes Rs 2) only as application fee may be sent to the Under Secretary, Extramural Research Division, Council of Scientific & Industrial Research, Rafi Marg, New Delhi 110001 so as to reach him on or before 12 October 1979. Incomplete applications or applications received after the closing date will not be considered and no intimation will be sent to the applicant/sponsor. Applications must be sent under registered acknowledgement due cover.



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All-India Coordinated Project on Complex Sulphide Ores Utilization

An All-India Coordinated Project on utilization of complex sulphide ores has been undertaken jointly by the Regional Research Laboratory (RRL), Bhubaneswar; the National Metallurgical Laboratory (NML), Jamshedpur; the Central Electrochemical Research Institute, Karaikudi; the International Business Machines (IBM), Nagpur; and the Engineers India Ltd, New Delhi. A meeting of the coordinating organizations was held on 7 July 1979 at RRL, Bhubaneswar, under the chairmanship of Prof. P.K. Jena, Director, RRL, Bhubaneswar, and member, State Planning Board, Orissa, to chalk out a plan of R&D work for the project.

Following discussion of the work done by the concerned organizations, a plan of work was decided and assigned to all the participating organizations. RRL would undertake, along with NML and IBM, mineralogical, petrographic and beneficiation studies. Considering the expertise and facilities available at RRL, it was decided to continue the work on ferric chloride and slurry chlorination and pressure leaching of complex sulphide ores. □

All-India Coordinated Project on Extraction of Nickel

An All-India Coordinated Project on extraction of nickel has been under-

taken jointly by RRL, Bhubaneswar, and NML, Jamshedpur. At a meeting of scientists of the two laboratories, held at RRL, Bhubaneswar, on 6 July 1979 under the chairmanship of Prof. P.K. Jena, the work done by the participating laboratories was discussed in detail. It was decided that large-scale trials should be undertaken for which the pelletization-calcination-roasting-leaching-solvent extraction-electrolysis route should be followed. RRL, Bhubaneswar, would take up work on solvent extraction and electrolysis, whereas NML, Jamshedpur, would concentrate on roasting and leaching studies. □

Survey of Pollen and Fungal Spores: Coordinated Project

A multi-institutional, multidisciplinary coordinated research project on aerobiological survey of pollen and fungal spores in India, for identification of allergens, with the National Botanical Research Institute (NBRI), Lucknow, and the CSIR Centre for Biochemicals, Delhi, as the principal coordinators, has been recently sponsored by the coordination council for the biological sciences group of CSIR laboratories. The main objectives of the project are to establish pollen-spore allergens occurring in air in different climatic zones of India; to prepare local, regional and finally, national pollen-spore calendars and atlases; to establish standards for purity of the allergenic pollen and spores *en masse*; to help prepare antigens for diagnosis of allergies; to prepare a monograph on the botany of Indian

allergenic plants; and to help forecast fungal diseases of tea crop in eastern India.

NBRI will coordinate the botanical studies under the project, and the CSIR Centre for Biochemicals will look after the clinical studies. Nineteen Indian universities, 17 CSIR laboratories, three institutes of the Indian Council of Agricultural Research and seven other institutions will participate in the botanical studies, covering various regions of the country. A number of practising doctors and medical centres will undertake clinical studies with the atmospheric pollen and spores provided by the above institutions.

An aeroscope, an apparatus to trap the air-borne pollen and spores, has been specially designed for this project and fabricated with the help of the Lucknow branch of the Central Scientific Instruments Organisation, Chandigarh. □

Techno-economic Feasibility Report on Quinalphos Supplied to Industry

A techno-economic feasibility report on Quinalphos, an important organophosphorus pesticide, has been supplied to Nagarjuna Agro & Steel Corporation,

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Vijayawada. The Regional Research Laboratory (RRL), Jorhat, in collaboration with the Regional Research Laboratory, Hyderabad, developed the process know-how for Quinalphos under an integrated programme of CSIR laboratories for the development of technologies for manufacturing pesticides to minimize the import of such technologies. The process know-how on Quinalphos was demonstrated to Shriram Pesticides Limited (a division of Shriram Bearings Limited), New Delhi, at RRL, Hyderabad, from 30 April to 20 May 1979. Scientists from RRL, Jorhat, and RRL, Hyderabad, participated in the demonstration.

Punjab United Pesticides and Chemicals Limited, Chandigarh, signed an agreement with RRL, Jorhat, on 31 May 1979 for the know-how on Quinalphos.

A broad spectrum organophosphorus pesticide, Quinalphos has the unique property of being an insecticide as well as an acaricide. This combined efficiency is being increasingly sought after by the growers of cotton and sugar-cane, since the use of insecticide alone causes subsequent damage owing to development of mites. Quinalphos is also widely used for protection of vegetables, paddy, tea, citrus fruits, etc. It is effective in the control of thrips, mites, bollworms, hoppers, borers and the like, and especially in controlling diamond blackmoth.

The anticipated annual demand for the pesticide in the country is about 1000 tonnes. □

Kinetics and Mechanism of Corrosion and Passivation of Metals in Aqueous Media

Studies on the kinetics and mechanism of corrosion of zinc in concentrated sodium hydroxide solutions and iron in phosphoric acid, and the kinetics and mechanism of passivation of zinc in dilute sodium hydroxide solutions and steel in sodium phosphate solutions were made by Shri V.S. Muralidharan of the Central Electrochemical Research

Institute (CECRI), Karaikudi. Shri Muralidharan studied the theory and application of electrochemical kinetics of corrosion by potential and current step methods. The kinetics and mechanism were studied by galvanostatic and potentiostatic methods and transient methods (potential step and current step methods).

The investigation on corrosion of zinc in concentrated sodium hydroxide solution revealed that zinc dissolved as zincate ion and the cathodic reaction was the evolution of hydrogen. Corrosion took place uniformly and there was no film formation or surface change during measurement. The electrochemical rates of corrosion obtained by extrapolation of steady state anodic and cathodic Tafel lines to corrosion potential agreed among themselves and also with the rates obtained by weight change method. Extrapolation of transient anodic and cathodic Tafel lines to corrosion potential gave the same values but these were ten times the steady state values. Arrhenius plots for zinc in 5N and 10N sodium hydroxide solutions suggested diffusion control in the process. Hydrogen evolution was observed on addition of up to $10^{-3}M$ zincate and further increase of zincate shifted the potential to that of zinc/zincate exchange reaction. The diagnostic criteria for the hydrogen evolution reaction revealed that the discharge of sodium ions was rate determining.

Zinc/zincate reaction was studied in detail. The Bockris scheme held good for the steady state measurements with $Zn(OH)_2 + OH^- \rightarrow Zn(OH)_3^-$ as rate-determining step and the transient measurements could be understood better in terms of its reaction sequences.

The dependence of the corrosion potential and the corrosion current on solution parameters for steady state measurements agreed with the rate-determining step for the anodic reaction suggested by Bockris scheme only when the net anodic current, i.e. the difference between dissolution and deposition of

zincate reaction, was considered. The dependence of the corrosion current in transient measurements on solution parameters was also explained.

Passivation of zinc in dilute sodium hydroxide solutions was studied by potential step method. Zinc was passivated by the formation of two-dimensional films which grew with instantaneous nucleation. The formation of passive films took place in three monolayers over active centres on metal surface with the discharge of hydroxide ions as the rate-determining step.

The corrosion of iron in phosphoric acid solutions was studied. Iron dissolved forming Fe^{2+} ions and liberating hydrogen. The hydrogen evolution reaction had the discharge of H^+ ions as the rate-determining step and the anodic reaction showed agreement with Bockris scheme. The corrosion behaviour of iron in phosphoric acid was therefore similar to that of iron in sulphuric acid. An additional feature was the slow adsorption of phosphate ions which caused a reduction in the rate of corrosion with increase in acid concentration and increase in immersion time.

The passivation of steel in phosphate solution (pH 3-5) was studied by potential step method. The current-time transients recorded three peaks, which were due to the growth of two-dimensional films with instantaneous nucleation on active centres and the formation of films involved Fe^{2+}_{surface} as the rate-determining step.

Shri Muralidharan, who carried out the studies under the guidance of Dr K.S. Rajagopalan of CECRI, was awarded Ph.D. degree by the Banaras Hindu University, Varanasi, for his thesis based on the investigation. □

Food Science and Technology: Directory of On-going Projects

The Central Food Technological Research Institute (CFTRI), Mysore, has brought out a directory of on-going

projects in food science and technology and related areas in India. Published by CFTRI's National Information Centre for Food Science and Technology (NICFOS) under the National Information System for Science and Technology (NISSAT) programme of the Department of Science and Technology, the directory includes information on 958 projects under investigation during 1978 in 138 institutions.

The directory reveals that CFTRI, by virtue of its following a defined procedure in formulation and implementation of the projects and its higher financial and manpower inputs compared to other institutions except government departments, stands out as a significant institution specializing in food science and technology. The projects of government departments mostly concerned with production, distribution and evaluation of CFTRI-developed foods like Balahar, Balamul and Miltone. The agricultural universities and the Indian Council of Agricultural Research (ICAR), though they account for a larger number of projects, contribute mostly to areas peripheral to food science and technology. In ICAR, nearly 80% of the projects are investigated by the National Dairy Research Institute, Karnal, on dairy products. Among the other institutions contributing to this directory the government sponsored research institutes include the Bhabha Atomic Research Centre, Bombay, which conducts work on food irradiation, and others which either contribute to interface areas or are concerned with regulatory analytical and quality control aspects. The university departments and industries have a relatively small number of projects though they have a considerable budget. The contributions of the Indian Council of Medical Research are mostly by the National Institute of Nutrition, Hyderabad, in the field of nutrition and toxicology.

The entries in the directory are sequenced under broad subject headings

with subheadings wherever necessary. Subject index, institution index and investigator index are provided.

Each entry contains the following information: serial number; project title; name and address of the organization; project category; cost; duration; sponsor(s); investigator(s); description; report(s); and papers published.

Compiled and edited by I.R. Naganagoudar, M.V. Gopinath and S.V. Sangameswaran, the directory (demy 4to, Pp. 330 + viii) can be had from the Head, NICFOS, CFTRI, Mysore 570013. □

Herbal Drugs in Indian Pharmaceutical Industry

The National Botanical Research Institute (NBRI), Lucknow, has brought out a compilation with the above title. This publication gives an idea of the extent of use of herbal drugs or their crude extractives (not the fractionated active principles) by pharmaceutical concerns of India in their preparations. This incidentally highlights the need for a proper control on the collection, cultivation, processing, storing and marketing of drug plants keeping in view the genuineness, quality and the quantity of the plants and plant products required by the pharmaceutical industry.

The information has been retrieved from therapeutic indices, catalogues, brochures, pamphlets and advertizing hand-outs and packings and wrappers procured from dealers, medical practitioners and medical representatives, and directly from a few pharmaceutical concerns. The publication lists a total of 542 botanical species employed as drugs in 1674 formulations being marketed by 160 pharmaceutical concerns. It also gives the names of those drugs which go into more than 50 pharmaceutical preparations each, with 'Triphala' (*Hararrh*, *Bahera*, *Amla*) topping the list, by going into as many as 219 preparations.

The publication includes 4 indexes. The first lists the drugs used most

commonly in pharmaceutical preparations along with the names of the latter. The second provides common, trade or English names with corresponding botanical equivalents and the third, the botanical names with corresponding common, trade or English names of all those plants which have been mentioned by pharmaceutical concerns to have gone into their formulations. Some pharmaceutical concerns mention both the botanical and corresponding common names (at times disputable) in their catalogues, whereas others mention either the common names or the botanical names; the equivalents for the latter have been taken from standard works. The last index lists the pharmaceutical concerns which have been covered by the survey.

In view of the lack of standardization of the botanical identity of the crude drugs and widespread adulteration and substitution, this concise and consolidated account, listing the commonly used drugs along with their authentic botanical identification, extent of their usage, common formulations employing these drugs, pharmaceutical companies concerned, etc., is expected to benefit the students and practitioners of Indian medicine, pharmaceutical industry, scientists and planners concerned with the Indian systems of medicine as also those interested in the cultivation of medicinal plants.

Compiled by S.L. Kapoor and R. Mitra and edited by B.R. Juneja, the publication (demy 4to, Pp. 86 + viii price Rs 14) can be had from the Director, NBRI, Lucknow 226001. □

CSIR's EXTRAMURAL RESEARCH

Synthesis of High Temperature Organosilicon Elastomers

Under a CSIR scheme (Oct. 1975 - Dec. 1978) granted to her, Dr (Miss) P. Bajaj of the Department of Textile Technology, Indian Institute of Technology, New Delhi, attempted the preparation of high-strength room-temperature vulcanized (RTV) siloxane

elastomers with higher thermal stability in comparison to conventional styrene butadiene elastomers. An attempt was made to introduce silicon moiety in polystyrene by two routes: (i) introduction of silicon moiety in the main backbone, i.e. styrene-siloxane block copolymers, by anionic polymerization, and (ii) introduction of organosilicon as a side substituent by free radical copolymerization.

A number of ABA type triblock copolymers, poly (dimethylsiloxane- β -styrene- β -dimethylsiloxane), were synthesized by the anionic polymerization of styrene and cyclic siloxane monomer, hexamethylcyclotrisiloxane (D_3) or octamethylcyclotetrasiloxane (D_4) with the use of lithium or sodium biphenyl initiators.

Block copolymers of varying segment length and end groups were vulcanized at room temperature using tetraethoxysilane as a crosslinking agent and dibutyl tin dilaurate as accelerator. The extent of crosslinking was determined by swelling in toluene. Thermal ageing of the crosslinked RTV elastomers was studied at 250°C and 300°C. Thermal ageing of polydimethyl siloxane blended with 20 phr block copolymer showed only 15% weight loss at 300°C and 3.5% weight loss at 250°C in one hour; thereafter it stabilized. This indicated the higher thermo-oxidative stability of these elastomers.

Vinyl silanes were copolymerized with styrene and acrylonitrile by free radical initiators. Vinyl silanes chosen were of two categories depending on the position of silicon atom with respect to the vinylic double bond. For example, in vinylmethyldiacetoxysilane (VTAS) and vinylmethyldiethoxysilane (VTES), vinyl group is in the vicinity of silicon, whereas, in [(2-methacryloxy)ethoxy] trimethylsilane (2-MAETMS), vinyl group is at γ -position to silicon. The objective of choosing these two types of silanes was to study the effect of the vicinal silicon atom on the relative reactivity of vinyl silanes. The radical copolymerization of styrene (M_1) and VTAS, VTES and 2-MAETMS (M_2)

was carried out in bulk and in solution, in the temperature range 60-100°C using benzoyl peroxide as initiator.

The thermal behaviour of these copolymers was studied by thermogravimetric and differential thermal analyses. Though the initial decomposition temperature of the copolymers was slightly lower in comparison to polystyrene, the overall thermal stability as determined by activation energy of decomposition was higher.

Shri Sunil Kumar Varshney and Shri Dinesh Chander Gupta worked as research fellows under the scheme. □

Semiconductivity and Photoconductivity of Organic Molecular Crystals

In a CSIR research scheme (Aug. 1975-Feb. 1978) granted to him, Dr T.N. Misra, Reader in the Optics Department, Indian Association for the Cultivation of Science, Calcutta, investigated the effect of adsorption of various vapours and gases on the semiconductive properties of some nitroaromatics and polyenes. The investigation revealed that adsorption of gas enhanced the specific conductivity of these compounds significantly. The magnitude of semiconduction current enhancement depended on the electron donating/accepting properties of the semiconducting material and the adsorbed gas. Charge-transfer type of interaction was responsible for the change of semiconductivity. For the nitroaromatics, the pre-exponential factor σ_0 in the semiconductivity expression $\sigma(T) = \sigma_0 / \exp(-E/2kT)$ for these compounds could be expressed as $\sigma_0 / \exp(+E/2kT_0)$, where E is the observed activation energy and T_0 , the characteristic temperature, is a constant for the semiconducting nitroaromatic. This compensation effect is a very significant observation and shows that the dark conduction mechanism in these compounds is rather involved. A small polaron tunnelling through the molecular potential barrier may account for such a compensation effect.

The results of the study have indicated the possibility of developing a gas-sensing device whose principle is based on the fact that the adsorption and desorption of gases cause a change in electrical conductivity of organic semiconductors. With a suitable organic material this device could be made extremely sensitive (with some polyene semiconductors the conductivity enhancement on adsorption of certain gases is by a factor of 10^8).

A conductivity chamber suitable for semiconductivity and photoconductivity studies at different ambient atmospheres was also designed and fabricated during the tenure of the project.

Smt. Alpana Ghosh, a junior research fellow, was also associated with the project. □

Effect of Pesticides on Intestinal Brush Border Membrane Structure and Function

Extensive use of pesticides in agriculture and health care programmes has aroused great concern among environmentalists because of certain potent deleterious effects of pesticides observed in laboratory animals and humans. For instance, exposure of experimental animals to DDT and other chlorohydrocarbon pesticides induces fatty infiltration of liver, hepatic carcinoma and nervous disorders. Because of their toxic effects, such compounds have been banned in western countries, but owing to their easy availability and low cost, these insecticides continue to be abundantly used in developing countries like India.

A majority of the pesticides enter the body through an oral route in the form of food contaminants. According to WHO surveys, more than 90% of the pesticides are taken up by humans orally. Thus, it would appear that the digestive tract comprises the primary site of interaction for these toxicants before they could reach the other body tissues. In a new CSIR research scheme granted to him, Dr Akhtar Mahmood, Assistant Professor, Department of

Gastroenterology, Post-graduate Institute of Medical Education & Research, Chandigarh, proposes to examine the toxic effects of some of the commonly used pesticides on the gastrointestinal tract. These studies would include investigations on the absorption of sugars, amino acids, vitamins and trace metals and the digestive enzymes attached to the mucosal cell surface (disaccharidases, peptidases, alkaline phosphatase, etc.) in animals exposed to various pesticides for varying periods. The histological examination of the intestinal epithelium and the chemical composition of the brush border membrane, which is the primary site of terminal digestion and absorption, will also be investigated in animals exposed to pesticides. Efforts will be made to correlate the studies at the phenomenological, biochemical and histological levels to understand the molecular basis of intestinal dysfunctions in pesticide toxicity. The effects of pesticides on the intestinal physiology will also be studied in nutritionally deprived animals. □

Economically Important Tropical Dicotyledonous Trees

A systematic developmental and quantitative anatomical study of growth in some economically important tropical dicotyledonous trees is proposed to be made by Prof. K. Periasamy (chief investigator) and Dr K.V. Krishnamurthy (co-investigator) of the Department of Botany, Madras University Post-Graduate Centre, Tiruchirapalli, under a new CSIR research scheme granted to them. The 10 trees selected for the above study are species of *Swietenia*, *Tectona*, *Terminalia*, *Dalbergia*, *Calophyllum*, *Pterocarpus*, *Morinda*, *Albizia*, *Artocarpus*, and *Mangifera*. No developmental and quantitative anatomical studies on the growth of timber trees of tropical region have been made so far, and the mechanism of tree growth, growth ring formation, if any, and seasonal variations in cambial activity

and wood production are not known for these timber trees. There is also dearth of information on the anatomical and microchemical transition from the sap wood to the economically useful heartwood in these trees. The synthesis and accumulation of ergastic substances characteristic of heartwood needs to be studied in detail. A study of tree growth, besides contributing to the scanty knowledge of the phenomenon, would be of value in the applied fields of wood technology, timber production and utilization.

The study is proposed to be carried out in three phases. In the first phase,

materials at different seasons from different parts of the trees will be collected and the commencement of cambial activity in the shoot will be studied. The quantitative variation in cambial activity in different seasons and in different regions of the plant will be studied in the second phase. Experimental work on three species involving foliar spray with growth substances and other chemicals will be taken up to study the effect on the activity of cambium and heartwood formation. In the final phase, the transition from sapwood to heartwood will be studied. □

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Filament Winding Machine

The National Aeronautical Laboratory (NAL), Bangalore, has developed the know-how for the manufacture of a filament winding machine and has patented the design.

Filament winding is a process by which glass or metal in a continuous filament form and a compatible polymer are combined to make a reinforced plastic structure. Fibreglass reinforced plastics (FRP) are light-weight materials possessing good mechanical and electrical properties and excellent resistance to corrosion by chemicals. These materials are widely used in aeronautics, space, electrical, chemical and allied industries.

The main elements of the machine developed at NAL are: a mandrel drive system, a feeder drive system and the associated electrical circuits for starting and stopping the above drive systems. There is also an electrical coupling for simultaneous stopping and starting of the two drive systems. The mandrel drive system has a three-phase electric motor, a reduction gear box, a mandrel mount, etc. for obtaining different mandrel speeds. The feed drive system consists of an electric motor, a lever-operated gear box, a feeder carriage, a screw rod to facilitate feeder carriage reciprocation, motion limit switches,

safety limits, and a roving delivery system.

A wetting system provides a regulated feed of resin on to the fibreglass roving during the winding process. Suitable squeeze rollers are used to secure uniform wetting and to control the resin content.

The assembly comprises a superstructure on which are mounted a fibreglass roving mount with a variable speed drive for adjusting the fibre tension, a resin wetting system including an excess resin remover, a pre-curing chamber, a tension adjusting pulley, a tension measuring device, a fume duct, a console for electrical circuitry, etc.

The specifications of the filament winding machine are as follows:

Max. diam.	: 140 mm.
Min. diam.	: 25 mm
Max. length	: 750 mm
Winding angle	: 30° helix to 89° circumference
No. of mandrel speeds	: 8
Max. feeder speed	: 31 m/min.
Min. feeder speed	: 0.47 m/min.

NAL has fabricated a number of winding machines and has supplied them to several organizations. The performance of these machines has been found to be excellent.

The main equipment required for the manufacture of these machines are gear

head lathe, drilling machine, cutting machine, grinding machine, and welding set. All these are available indigenously.

The main components needed for manufacturing the winding machine are: reduction gear box, electric motor, gear lathe, contactors, push button switches, and other hardware items.

The total capital for an economically viable unit has been estimated at Rs 1.6 lakh, excluding the cost of land and building. The cost of production has been estimated at Rs 30,000 per machine, whereas a similar imported machine costs about Rs 80,000.

The tentative terms for the transfer of know-how are: lump sum premium Rs 15,000, recurring royalty, 3%; period of licence, 7 years; and nature of licence, non-exclusive.

Further details regarding the process (NRDC Process No.807-03-9) can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024.

X-ray Image Intensifier Closed Circuit Television System

The Central Scientific Instruments Organisation (CSIO), Chandigarh, has developed an X-ray image intensifier closed circuit television system. The system is very useful in continuously viewing the X-ray images. It provides very low dosage of X-rays to the patient as the image is intensified by about 6000 times with the help of an image intensifier tube. The image is displayed on a TV screen. The result is a bright clear image with a greatly reduced dosage. The image can be simultaneously viewed by several persons. The system is of immense diagnostic value in the visualization of bone fractures, observation of joint movements, visual control of catheter insertion, localization of foreign bodies, etc.

The X-ray image intensifier tube is a vacuum tube having an input fluorescent screen and a photocathode, which converts the X-ray pattern into an electron pattern.

The X-ray image beam, emerging from the subject being examined, first passes through the input window of the tube. The window is made of special low-adsorption, low-scatter glass. It is then absorbed by the input detector screen, where the X-ray photons are converted into light photons. A photocathode coupled to the input screen is excited by these light photons, producing electrons. The electrons thus emitted are accelerated and focussed by appropriate electric fields. The electrons then impinge on the output fluorescent screen (type P20) which converts them into light photons giving a high brightness output image. This image is several thousand times brighter than that obtained with a conventional radiosopic screen substituted for the tube's input window. The brightness gain is obtained partly from the energy imparted to the electrons during their acceleration, and partly from the reduction in the diameter of the tube's output image as compared to the input image.

The image at the output is magnified and coupled to the closed circuit television camera through a lens system. It is then displayed on the TV screen.

The specifications of the X-ray image intensifier closed circuit TV system are as follows:

Mobile X-ray unit	
Radiographic	: 50 mA at 65 kV (peak)
Fluoroscopic	: 50 mA at 65 kV (peak)
Image intensifier tube	: Thomson TH 9415
Optical coupling	: Objective lens
Closed circuit television system	: Haritron micro-video camera and monitor
High voltage power supply (to be fabricated)	
Output voltage	: 26-30 kV (adjustable)
Output current	: 120 μ A
Ripple	: 0.5%
Oscillator frequency	: 70 kHz $\pm$ 10%

The main test equipment required are universal avometer, oscilloscope, electrostatic voltmeter, etc. Of these, the electrostatic voltmeter is to be imported.

The X-ray generator has to be purchased from X-ray manufacturing unit and the X-ray image intensifier tube and the objective lens have to be imported. Other components are available indigenously.

It will be economical for a manufacturer in allied fields to take up the production of this system. The cost of production will be about Rs 75,000 per system.

Further particulars regarding the process (NRDC Process No.802-03-9) can be had from: Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024. □

Bloating Type Casting Pit Refractories

The Central Glass & Ceramic Research Institute (CGCRI), Calcutta, has developed a process for manufacturing bloating type casting pit refractories. The casting pit of a steel plant constitutes a significant area where the operational requirement of refractories is one of the highest. The annual demand for such refractories in India with the installed capacity of about 10 million tonnes of steel is as follows: pouring refractories (nozzles, stoppers, etc.), 15,800 tonnes; and ladle bricks, 1,14,000 tonnes (high grog, 33,400 tonnes; low grog, 57,100 tonnes; and plastic process fine bricks, 23,500 tonnes). With the envisaged programme of producing about 1.8 million tonnes of steel annually through various mini steel plants, there will be a considerable increase in the requirement of these refractories.

At present, most of the refractories are of non-bloating type and are not very satisfactory. Partly, bloating type refractories are imported. In 1975-76, the requirement of casting pit refractories was about 1.3 lakh tonnes. The present market price for ladle bricks is about Rs 500-800 per tonne, and for stoppers and nozzles, Rs 1500-3000 per tonne. Because of the limited availability of bloating type refractories for

casting pit anywhere in the world, the products have an export potential also.

While aluminosilicates of 30-40% Al_2O_3 content are employed largely as ladle lining and fireclay, clay-graphite, fireclay magnesite inserts as nozzles, stopper heads, etc., there is a continued effort to improve the performance in terms of resistance to erosion and corrosion by metal and slag, non-wettability to steel, and long life in service. The non-metallic inclusions in steel are ascribed to the poor quality of these refractories and the poor life adds to the cost of production of steel. Pyroplasticity in this class of refractories during operation is considered to be a distinct advantage. Since the successful application of refractories made out of a naturally occurring non-refractory, bloating type of clay in USA, there have been attempts to ascertain the factors responsible for making cleaner, if not cheaper, steel. Synthetic refractories of this category have not been produced so far.

Through a series of experiments at CGCRI the prerequisites for bloating clay-based refractories have been attained with the development of a liquid phase of requisite viscosity and proportion at a fairly low temperature and with an almost simultaneous evolution of a gaseous phase to be entrapped in the liquid formed. The results show promise of producing bloating type refractories by a suitable blending of commonly available, indigenous clays and other raw materials through a precise control over process variables, including minor additions of certain compounds. The technology involved in the process, for which a patent has been filed, does not deviate significantly from the conventional practice of hollow ware of brickmaking insofar as equipment and machinery are concerned. The product has been tested at Durgapur in 10 trials conducted against different grades of steel and in varying capacity of ladles and has been found satisfactory.

All the major equipment required for the plant are either indigenously

available or can be fabricated in the country.

The total capital outlay for a plant of capacity 20,000 tonnes per annum has been estimated at Rs 84 lakh.

Further particulars regarding the process (NRDC Process No.799-02-9) can be had from the Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024. □

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316/Del/79: Improvements in or relating to the inhibition of steel in cooling water in heat exchangers, N. Subramanyan, K. Balakrishnan, M. Raghavan, K. Ramakrishnaiah, B. Sathianandham & N. Palaniswamy—CECRI, Karaikudi.

318/Del/79: An electrochemical process for the production of 2-amino-4-nitrotoluene (Fast Scarlet G base) from *o*-nitrotoluene, H.V.K. Udupa, M.S. Venkatachalapathy, S.I. Chidambaram, R.K. Srinivasan & L. Balasubramanian—CECRI, Karaikudi.

340/Del/79: Process for catalytic methylation of phenol to produce anisole and *ortho* substituted products, M. Ehsan, G.S. Salvapati, M. Janardan Rao & R. Vaidyeswaran—RRL, Hyderabad.

347/Del/79: Improvements in or relating to recovery of $\alpha(+)$ camphor-sulphonic acid during the resolution of DL-phenylglycine, R.B. Mitra, B.N. Joshi, V.K. Hinge & M.V. Natekar—NCL, Pune.

348/Del/79: Improvements in or relating to the preparation of zinc/ethyl silicate primer for protection of steel structures, K.S. Rajagopalan, S.N. Guruviah & M. Sundaram—CECRI, Karaikudi.

365/Del/79: Improved hydraulically driven circumferential prestressing machine for concrete cone pipes, M.A. Parameswaran, M.M. Rao, S. Krishnamurti—IIT, Madras; B. Venkateswarlu, J.S. Sundaram & V. Shanmugam—SERC, Madras.

366/Del/79: Ejector coupled absorption refrigeration system for cold storage applications using low-temperature heat source from solar flat plate collector, S.C. Pattanayak & B.C. Raychaudhuri—CMERI, Durgapur.

372/Del/79: Improvements in ion-exchange membranes based on polyvinyl chloride interpolymers, V.K. Indusekhar, W.P. Harkare & K.P. Govindan—CSMCRI, Bhavnagar.

373/Del/79: Contrast markings over metals and alloys by electrochemical technique, S. Guruswamy, P. Jayakrishnan, V. Yegnaraman, N. Shanmugam & R. Rajagopal—CECRI, Karaikudi.

398/Del/79: Improved fluidized bed boiler, P. Basu—CMERI, Durgapur.

400/Del/79: A process for purification and enrichment of low-grade molybdenite concentrates, A.K. Saha, S.R. Srinivasan, D.D. Akerkar & V.A. Altekar—NML, Jamshedpur. □

PATENTS SEALED

32/Cal/75 (143695): Improvements in or relating to sintered porous metal electrodes containing silver catalysts for use as oxygen electrodes in low-temperature hydrogen-oxygen fuel cell, V.K. Venkatesan, H.V.K. Udupa, K.S.A. Gnanasekharan, R.S. Pattabiraman, T.R. Jayaraman, C.P. Janaki Amma Indira & R. Chandrasekaran—CECRI, Karaikudi.

67/Cal/75 (143696): Improvements in or relating to sintered porous metal hydrogen electrodes for use in hydrogen-oxygen fuel cell, V.K. Venkatesan, H.V.K. Udupa, R. Pattabiraman, T.R. Jayaraman & C.P. Janaki Amma Indira—CECRI, Karaikudi.

116/Cal/75 (143659): Improvements in or relating to preparation of pigment grade calcium chromate, S.N. Guruviah, M. Sundaram, V. Chandrasekaran & K.S. Rajagopalan—CECRI, Karaikudi.

588/Cal/75 (143685): A process for the manufacture of semiconductor devices such as mesa devices, R.P. Gupta & J.P. Pachori—CEERI, Pilani.

916/Cal/75 (143404): Improvements in or relating to decorative anodizing of aluminium and its alloys in alkaline electrolytes using alternating current, B.N. Sheno, V. Balasubramanian & S. John—CECRI, Karaikudi. □

PERSONNEL NEWS

Appointments/Promotions

Promoted, on assessment, at the Central Drug Research Institute (CDRI), Lucknow, are: Dr G.R. Chaudhury (Scientist EI; 18 Dec. 1978); Dr Prem Sagar (Scientist EI; 1 March 1978); Dr K.P. Agarwal (Scientist EI; 1 Dec. 1978); Dr G.P. Dutta (Scientist EI; 1 Dec. 1978); Dr C.R. Prasad (Scientist EI; 1 Sep. 1978); Dr S.N. Chatterjee (Scientist EI; 1 Dec. 1978); Dr S.C. Maitra (Scientist C; 21 Nov. 1978); Dr O.P. Shukla (Scientist C; 1 May 1978); Dr J.M. Khanna (Scientist C; 4 May 1978); Dr D.N. Gupta (Scientist C; 20 Oct. 1978); Shri A.K. Roy (Scientist C; 1

Jan. 1978); Shri I.S. Mathur (Scientist C; 22 July 1978); Shri R.K. Mukherjee (Scientist BI; 25 July 1978); Dr S.R. Chowdhury (Scientist B; 2 Sep. 1978); Shri V.B. Sinha (Scientist B; 31 Oct. 1978); and Shri Ram Das (Scientist AI; 23 July 1978).

* * *

Appointments at CDRI include those of Shri R.S.L. Srivastava (Laboratory Services Engineer; 1 Feb. 1979); Dr C.M. Gupta (Scientist C; 14 Sep. 1978); Dr Kanwal Raj (Scientist B; 16 July 1978); Shri K.N. Sen Gupta (Documentation Officer; 4 Aug. 1978); Dr A.K. Saxena (Scientist B; 13 June 1978); Dr Susheel Durani (Scientist B; 13 June 1978) and Shri C.X. George (Scientist B; 8 May 1979).

Resignations

Dr V. Chalapati Rao of the Life Sciences Division of the National Environmental Engineering Research Institute, Nagpur, has resigned (30 Aug. 1979).

The persons selected will be appointed on contract for a period of six years which would be confirmed after an initial period of two years of satisfactory service. Qualifications and experience are relaxable in the case of candidates otherwise found suitable for the posts. Other conditions of contract will be supplied on request.

Age Limit: Below 50 years, relaxable in special cases. Those interested may obtain two copies of the prescribed standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific and Industrial Research, Rafi Marg, New Delhi 110001 on or before 19 October 1979. They can also obtain a brochure on the aims and objects and the latest annual report of the Institute. Completed *curriculum vitae* proforma will be received in this office on or before 22 November 1979.

Advertisement No. 17/79

It is proposed to appoint one Scientist F (Deputy Director) in the Central Institute of Medicinal & Aromatic Plants, Lucknow.

Job Requirements: This is a senior research management post and the incumbent will have to provide high level leadership in identification, planning and coordination of research projects at the headquarters as well as regional centres of the institute. The incumbent will also have to assist the Director in over-all management and administration of the institute.

Qualifications and Experience: The candidate should possess high academic qualifications in the field of pharmacognosy or agriculture with at least 10 years' experience of research on cultivation of medicinal and aromatic plants.

Salary/Conditions of Service: The salary scale attached to the above post is Rs 2000-125/2-2500. Initial pay will be fixed according to merits. The person selected will be appointed on contract for a period of six years which would be confirmed after an initial period of two years of satisfactory service. Qualifications and experience are relaxable in the case of candidates otherwise found suitable for the post. Other conditions of contract will be supplied on request.

Age Limit: Below 50 years, relaxable in exceptionally qualified cases. Scientists/technologists interested may obtain two copies of the standard proforma for sending their *curriculum vitae* from the Chief (Administration), Council of Scientific and Industrial Research, Rafi Marg, New Delhi 110001, before 22 October 1979. They can also obtain a brochure on the aims and objects and the latest annual report of the institute. Completed *curriculum vitae* proforma will be received in this office on or before 24 November 1979.

Canvassing in any form and or bringing in any influence, political or otherwise, will be treated as disqualification for the posts.

COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Advertisement No. 16/79

It is proposed to appoint three Scientists F in the scale of Rs 2000-125/2-2500 for the Central Drug Research Institute, Lucknow.

Job Requirements: For post (i) To provide high level leadership for planning and execution of programmes for generation of toxicity data of new drugs, development of techniques for toxicity evaluation, design and planning of projects in experimental medicine relevant to the needs of country, familiarity with drug control rules for assessment of toxicological data and assisting the Director in management functions.

For post (ii): Planning, conducting and guiding research on experimental chemotherapeutic and immunological aspects of tropical parasitic diseases, specially malaria and filaria; coordinating with other disciplines of the institute in development of new drugs and vaccines for parasitic disease; and collaboration with other organizations in the field trials of potential drugs and diagnostic techniques and assisting the Director in management functions.

For post (iii): Planning, guiding and conducting research on development of processes for production of bulk drugs and their intermediates; evaluation of the process efficiencies and costing so as to make the

processes economically viable, interacting with the pharmaceutical and allied industries to identify their problems and requirements and with government and other organisations concerned with development of the Indian drug industry; assisting the Director in management functions.

Qualifications: For post (i) MBBS with a postgraduate degree such as M.D. or Ph.D. with evidence of research in a related field and considerable experience in a senior capacity in a toxicology laboratory in industry or a research organization concerned with drug research or applied medicine.

For post (ii): High academic qualifications in clinical parasitology, parasitic chemotherapy or related subject, having a post-MBBS degree. Considerable experience in a senior position of conducting and guiding research in the fields of experimental chemotherapy and immunology of parasitic diseases.

For post (iii): high academic qualifications in organic chemistry/chemical technology/chemical engineering, with considerable experience in a senior position in production of bulk drugs and allied chemicals or development of technology for drugs and intermediate in industry or an R&D laboratory; in-depth knowledge of the Indian pharmaceutical/industry and its problems.

Salary/Conditions of Service: The salary scale attached to the above posts is Rs 2000-125/2-2500. Initial pay will be fixed according to merit.



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Low-cost Weaning Food: CFTRI

Under its programme on development of technology for rural application, the Central Food Technological Research Institute (CFTRI), Mysore, has developed a new low-cost nutritious weaning food supplement based on locally available cereals and legumes. The product will go a long way in combating malnutrition among infants and children, especially in villages. Preliminary trials have testified to the acceptability and nutritional qualities of the product.

The weaning food contains malted *ragi* powder and malted green gram powder in 70:30 ratio, its protein content being about 12%. A daily supplementation of 50-75 g of the product compensates for the protein-calorie deficiency in children.

The nutritive quality and digestibility of the product are enhanced by malting foodgrains used in the preparation of the product. Optimal conditions have been worked out for the operations in malting, viz. soaking, germinating, toasting and dehusking, so as to achieve maximum nutritional advantages. The product costs about Rs 5/kg, or about 40 paise a day to feed a child, which is cheaper than commercially available brands of weaning foods.

The product and its processing operations were tried in a village near Mysore. Initially, the product was manufactured at CFTRI and distributed to mothers, with suitable instructions, for feeding their children. Later, a trial production unit was set up in the village to familiarize the villagers with the processing operations to

convince them about the advantages of having the production unit in the village itself. The equipment needed are simple and easily available. The huller type rice mill and flour mill which are commonly used in villages can be used with advantage for dehusking and grinding the ingredients.

Setting up of production units for manufacture of weaning food can create more employment opportunities in villages. Even housewives can manufacture the product by working collectively. Experiments are being carried out to develop similar weaning food formulations by using other cereals and legumes. □

Asafoetida in Powder and Tablet Forms: CFTRI

The Central Food Technological Research Institute (CFTRI), Mysore, has standardized a technique for the preparation of a good quality compounded asafoetida (*hing*) in powder and tablet forms, at the request of a party.

Such compounded flavours for food preparations are designed to provide retention of flavour characteristics with long shelf-life.

Asafoetida, oleogum resin obtained from the stem and root of *Ferula* plants grown mainly in Afghanistan and Iran, has a very strong flavour, and has, therefore, to be diluted before use. It is marketed in the compounded form by the use of diluents like gum arabic, edible starch or cereal flour. Commercial asafoetida, owing to its high moisture content, often develops molds on the surface, especially when packed in polyethylene bags, and its

quality varies. The CFTRI technique overcomes these problems.

The quality of asafoetida depends on its volatile oil content, which provides its characteristic odour. CFTRI has developed a simple method to determine the flavour strength in asafoetida. □

Roman Chamomile Introduced in India

Flowers of *Anthemis nobilis* Linn. on distillation yield an essential oil known as Roman or English Chamomile oil. The oil, used in high-grade perfumes, is highly priced (Rs 4500/kg) in the international market. In spite of the fact that it has a good demand in the industry, no efforts have been made to introduce Roman Chamomile in the country. Attempts to introduce this essential oil bearing plant (from seeds of Roman origin obtained through S.H. Kelkar & Co., Bombay) at the Kukrail Research Station of the Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow, have shown encouraging results. The flowers contained 0.4% essential oil (dry wt basis) as compared to the yield of 0.32-1.00% obtained in France. A yield of 10.5 kg dry flowers was obtained from an area of 400 m². Efforts are being made for

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commercial cultivation of the crop in the Kashmir Valley. □

Canned Drinking Water Produced Commercially

Regular production of canned drinking water based on the know-how provided by the Central Food Technological Research Institute (CFTRI), Mysore, has been started by a firm, IMS Life Saving Appliances, Bombay. The firm is reported to have canned about 35,000 cans of water during last year.

Canned drinking water is an essential item in the emergency survival ration of air and naval forces; it is also an integral part of inflatable life rafts and life boats. Until CFTRI developed the know-how some years ago, canned water was being imported for the use of India's Defence Services.

Although the process of canning water may seem quite simple, several technical difficulties such as internal rusting of the can, deposition of sediment, pick-up of off-flavours, and development of haziness have to be overcome. Most of the emergency survival rations have been designed to have a minimum shelf-life of two years. After systematic investigations, CFTRI succeeded in standardizing conditions for canning drinking water conforming to stringent specifications, with a shelf-life of two years. □

Control of Wilt of Geranium

Geranium oil, which is obtained by distillation of leaves and flowering tops of *Pelargonium graveolens* Linn., Herit, is used chiefly in high-grade perfumes, scents and cosmetics. Only a limited amount of oil is produced in India and most of the demand of the industry is met through imports at a cost of Rs 17 lakh annually. A limiting factor in extending its cultivation is the wilt disease which causes damage to the crop. The wilt of geranium was recorded for the first time, in 1969, at the Bangalore experimental farm of the

Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow. A detailed study was made on the etiology and syndrome of the disease and it was found that *Fusarium redolens* Wollenweber, a soil-borne fungus, was responsible for the wilt. Fungus infection was favoured by the formation of crack at the basal region of the plant during weeding, harvesting, etc. due to innate inability of the plant to withstand its own weight. The termite infection, which is not uncommon, also contributed to increase in wilt infection.

In order to control the malady, an integrated approach was started at CIMAP's Bangalore regional centre. The following are the main findings of the investigation:

(1) Cuttings from healthy mother plants treated with 0.03% Benlate and planted in disease-free nursery were effective in giving healthy seedlings.

(2) Application of Chlorodane 20 E.C. in the form of 1% solution in the field before transplanting reduced the termite infection.

(3) Planting at 60 × 30 cm spacings minimized the formation of cracks at the basal region of the stem by reducing the lateral growth.

(4) Of the several fungicides, such as Dithane Z-78, Dithane M-45, Benlate, Captan, Vitavax, Plantavans, and Brassicol, tried on the crop in an experiment in randomized block design with four replications, Benlate (0.03%) application at nursery, transplanting, pre- and post-harvest stages, was found to be relatively better.

With this integrated approach the percentage mortality was reduced from 81 to 10%. It has, therefore, become possible to maintain the crop in a satisfactory condition and provide scope for large-scale cultivation. □

Process for Manufacture of Nitrile Rubbers*

Nitrile rubbers (NBR) are special-purpose synthetic rubbers which find varied applications in oil, gasoline and solvent hoses, oilseals, O-rings, gaskets, adhesives, etc. The major raw materials, acrylonitrile and butadiene, are manufactured in India. The National Chemical Laboratory (NCL), Pune, has developed technology for the manufacture of three major grades of NBR (which account for more than 80% of NBRs used in India). The process has been licensed to Synthetics and Chemicals Ltd, Bombay. Following pilot plant and consumer acceptability studies the firm commissioned, in 1977, a commercial plant with a capacity of 2000 tonnes per annum of NBR. The cumulative production of NBRs based on NCL know-how from 1974 to March 1979 was 1276 tonnes valued at Rs 245.59 lakh.

*Dr S. Gundiah, Dr S.L. Kapur, Shri A.A. Gunari, Shri M.B. Sabne, Shri C.R. Rajan and Shri R.A. Kulkarni of the National Chemical Laboratory, Pune, were jointly awarded Rs 5000 as the National Research Development Corporation of India's 1979 Independence Day Award for this process [CN, 29(1979), 121].

In the NCL process, acrylonitrile and butadiene are emulsion copolymerized at 5°C in the presence of an emulsifier, electrolytes, chain-length regulator, catalysts, etc. At predetermined optimum conversions, the polymerization reaction is annihilated by the addition of suitable short-stops. Ageing resistors are added and the solid rubber is obtained by regulated addition of brine and acid. The rubber is washed free of undesirable materials and dried.

Polymerizations and copolymerizations of butadiene, when carried out to high conversions, result in premature crosslinking of the rubbers which consequently have inferior physical properties and processing characteristics. The conversions are therefore optimized to achieve the highest permissible conversions consistent with good-processibility product, keeping the recovery and recycle of the unreacted monomers to the minimum. Polymerization at the low temperature, which leads to superior processing properties in the rubbers, is achieved by the use of suitable redox initiators. The

reducing agent incorporated in the redox recipe is kept to the minimum by incorporating auxiliary reducing agents. This results in rubbers with superior storage stability as the concentration of the multivalent metallic ions in the rubber which have adverse effects on the storage stability of the rubber is greatly reduced. The emulsion polymerization is a heterophase reaction. Polymerization proceeds in discrete monomer-swollen polymer particles, the supply of the monomer being maintained by their diffusion through the water medium. The difference in reactivities of the two monomers results in a composition drift during the polymerization. In the NCL process, incremental addition of the faster consumed monomer is practised to achieve greater composition homogeneity. The emulsion stability is of critical importance to prevent the fouling of the reactor, but it should not cause additional problems at the coagulation stage. Synergistic combination of stabilizers is incorporated in the rubber to achieve better storage stability.

Synthetic rubbers are manufactured to stringent specifications regarding their processability characteristics and physical properties. Minor variations in ultimate conversions, chemical composition, short-stop efficiency, coagulation and drying, etc., severally and individually, result in drastic variations in the processing characteristics of the rubbers. The special features of the NCL process are linear reaction rates and thus better process control, greater composition homogeneity and improved storage stability. The process was standardized in a laboratory pilot-plant yielding about 7 kg of rubber per batch.

Synthetics and Chemicals Ltd, collaborated in market survey, and evaluation of the laboratory produced rubbers. Some of the aspects of technology such as recovery and recycle of the unreacted monomers and effluent disposal were exclusively worked out by the firm. □

Process for Production of Dehydrated Green Pepper and Buff-Coloured White Pepper*

India exports black pepper to the tune of 29,000 tonnes out of a total annual production of about 32,000 tonnes. The export figure has remained static for many years. There is need to produce and export other varieties of pepper in order to increase exports and earn more unit value for the products. Indonesia and Malaysia export white pepper to the tune of 20,000 tonnes, while India does not produce this commodity. Our traditional agricultural practices are not suitable for making white pepper. Indian growers do not like to let the pepper ripen on the vine, because of the losses resulting from dropping and eating of fruits by birds. Hence, we have to think of other methods of making white pepper. Similarly, there is need to produce and export canned or bottled green pepper which is liked by some European consumers for garnishing meat dishes. For the past few years, this product is being exported from India in small quantities.

Research was undertaken at the Central Food Technological Research Institute (CFTRI), Mysore, to develop methods for producing white pepper starting from mature green pepper, and dehydrated green pepper from immature green pepper. If simple and successful methods could be evolved, which could be adopted by the growers themselves, substantial quantities of the new products could be exported from the country. This would increase export earnings from pepper and also fetch higher returns for the grower.

The buff-coloured white pepper is more economical and can be a good

substitute for white pepper, which is already being marketed by far eastern countries. The dehydrated green pepper is a more convenient product than canned pepper and is also cheaper.

Dehydrated Green Pepper

The varieties suitable for making dehydrated green pepper are those that have small and uniform sized berries of dark green colour (Kalluvally, Karimunda, Chetan, etc.). Maturity is one of the important factors. Immature pepper suffers in yield and crumbles under a slight pressure. Overmature pepper is hard and becomes brown or black. About half to three-fourths maturity is suitable. Freshly harvested green pepper is de-stalked, freed from pin heads, light berries, etc. and washed. The cleaned berries are given a suitable heat treatment to inactivate the enzymes, followed by a chemical treatment and finally dried by mechanical means under controlled conditions. The dried green pepper remains green over long periods of storage and rehydrates easily in warm water, giving a product with flavour and other qualities similar to those of fresh pepper. It is because of its fresh green colour and flavour that the rehydrated green pepper is extensively used in European countries to garnish dishes like steaks.

The main advantages of the dehydrated green pepper are reduction in shipping cost, elimination of expensive packing material, and longer shelf-life.

Buff-Coloured White Pepper

Traditionally, white pepper is made from fresh ripe pepper. In this process the material is soaked in water, de-skinned, and dried in the sun. The yield of the finished product is about 20%. The new process developed at CFTRI gives a yield of 30%, as the skin remains intact. The pepper is buff-coloured and the colour improves when ground into a fine powder. Fully mature

*Dr Y.S. Lewis, Shri E.S. Nambudiri, Shri N. Krishna Murthy, Shri S. Shivasankar, Shri C.P. Natarajan, Dr A.G. Mathew and Miss Sankari Kuttyamma of the Central Food Technological Research Institute, Mysore, have been jointly awarded Rs 5000 as the National Research Development Corporation of India's 1979 Independence Day Award for this process [CN, 29(1979), 121].

green pepper, as it is harvested for making black pepper, is given a heat treatment to arrest enzyme activity and then a mild chemical treatment. The product is dried in the sun to get a buff-coloured product resembling black pepper, except for colour.

The technical know-how for making these products has been released to more than 20 entrepreneurs through the National Research Development Corporation of India. Many of them have started production and are exporting. During 1975-76 India exported 0.5 tonnes of dehydrated green pepper valued at Rs 0.27 lakh, and the exports shot up to 81.64 tonnes valued at Rs 57 lakh during 1977-78. The main markets are the Federal Republic of Germany, France, Sweden, Kuwait, and Baharin. □

Appropriate Technology Programme for North-Eastern Region

Jorhat Laboratory's Expertise Sought

The Appropriate Technology Unit, Department of Industrial Development, Ministry of Industry, has shown interest in utilizing the expertise and experience of the Regional Research Laboratory, Jorhat, in developing an appropriate technology programme in the north-eastern India. The ministry has initially sanctioned Rs 2.70 lakh towards the establishment of four demonstration centres of citronella distillation units covering Arunachal Pradesh, Assam, Mizoram and Sikkim.

The laboratory's R&D efforts in this area are tailored to suit the needs of the region. RRL's experience in the north-eastern region has been unique because of its exposure to the problems of this region. Its present endeavour is to generate need-based appropriate technology and to play the role of a coordinating centre for this purpose.

The programmes will aim at developing an industrial base in the area with the help of the district industrial centres, now being established.

The approach at the initial stage could be through developments based on: (i) utilization of renewable and non-renewable resources, and (ii) utilization of waste materials.

The programme will be initiated with the following projects: (i) integrated project for the development and utilization of appropriate technology package for: (a) citronella cultivation and distillation, and (b) utilization of citronella wastes for making corrugated roofing sheets; (ii) development of ceramic industries in the north-eastern region; (iii) development of limestone industries; (iv) development of a cement-like product from paddy husk ash for use in masonry and foundation work; and (v) development of corrugated roofing sheets.

These projects have been identified through discussions with the Appropriate Technology Unit. Additional projects could be identified and implemented as the programme progresses. □

Fruitfulness of Grape Cultivars Thompson Seedless and Gulabi

Shri V.R. Balasubrahmanyam of the National Botanical Research Institute, Lucknow, has studied the pattern of fruit bud distribution on the cane, productivity of the cane in relation to its origin, response of the vines to differential pruning, and influence of NPK fertilizers and purines and pyrimidines; such as uracil, xanthine and caffeine, on the fruitfulness of the vines of two grape (*Vitis vinifera* Linn.) cultivars Thompson Seedless and Gulabi. The Gulabi vines pruned to 12 bud canes, and the Thompson Seedless vines pruned to 12-14 bud canes, gave the highest yield. Although uracil was found to be more effective than caffeine and xanthine for promoting RNA synthesis and enhancing fruitfulness in the Thompson Seedless vines, it is the ratio in which NPK are applied that influences the fruitfulness of Gulabi vines.

For the thesis based the study Shri Balasubrahmanyam has been awarded the Ph.D. degree of the Agra University. □

Inheritance of Genetic Variability, Heterosis and Combining Ability in *Helianthus annuus*

The nature of genetic variability, magnitude of heterosis and extent of inbreeding depression, as manifested in 17 morphological characters, have been studied by Shri A.K. Bajpai of the National Botanical Research Institute, Lucknow, in eight lines of sunflower (*Helianthus annuus* Linn.), selected from the genetic stock available in the laboratory. Through the diallel cross technique, the degree and direction of dominance, type of gene action, general and specific combining ability of different lines, number of effective factors, level of heterozygosity, heritability and the genetic advance have been estimated. The preponderance of additive genes has been indicated for a majority of these characters, though the non-additive genes are also preponderant for a few of these. On the basis of this study, lines suitable for different breeding programmes, such as for early maturity and short stature, high seed and kernel oil content, higher seed set, and high pollen production, have been recommended.

Shri Bajpai has been awarded Ph.D. degree of the Kanpur University for his thesis based on the study. □

Improved Strain of Java Citronella

The Regional Research Laboratory, Jorhat, has developed an improved strain of Java citronella, designated as Jorlab C2, and offers consultancy package which includes the supply of propagating materials free of cost (with a ceiling on the quantity of material supplied) to an individual party. The laboratory will charge a consultancy fee

of Rs 4000 for the improved strain and the consultancy will be valid for a period of one year. Under the consultancy service, the entrepreneur will be provided with details of the method of cultivation, distillation of the oil, and marketing of the product. Further conditions of the consultancy service can be had from: The Director, Regional Research Laboratory, Jorhat 785006. □

PROGRESS REPORTS

NML Annual Report: 1977-78

The annual report of the National Metallurgical Laboratory (NML), Jamshedpur, for 1977-78 brought out recently reveals that the laboratory's drive towards transfer of technologies and their implementation for commercial scale production has met with further success. The technology on electrolytic manganese dioxide has gone into commercial production. The licensee of the process, T.K. Chemicals Ltd, has set up a 1000 tonnes per annum plant at Trivandrum at an investment of about Rs 16 million. Manganese dioxide produced by the firm is finding ready market for dry cell manufacture. One more firm obtained licence for producing NML-PM2 alloy aluminium conductor, and started production. A commercial plant has been set up and commissioned by the licensee's firm for the production of bimetallic powders of copper-lead and leaded bronze. Production of vanadium pentoxide from alumina sludge based on NML know-how has commenced. In the transfer of technologies in all these cases, the NML scientists assisted in setting up and commissioning the plants.

The laboratory provided, on request, expertise on the technology for production of electrolytic manganese dioxide and setting up of a pilot plant of 50 kg/day under the Government of India's assistance programme to the Government of Burma. The technology of heat-resistant cast iron with nickel

and chromium was ready for release. The carrier blades made out of this alloy showed no deterioration in comparison to heavy oxidation and scaling of conventional chromium-nickel heat-resistant alloy, when put into service trial in TISCO's sheet mill reheating furnace operating at 900°C. The production technology of lead by 'NML-Alnama' process was also ready for release. Besides, the technologies of clay-graphite stopper heads from indigenous raw materials and magnesium based inoculant briquettes for production of nodular cast iron were released.

To prove the commercial viability of melting and rolling of the NML low-carbon soft iron, which was able to meet the requirements of railway signal line relays, the processing of ingots was successfully carried out at the Indian Ordnance Factory, Ichapore. The aluminium alloy conductor NML-PM53 was under field trials as a catenary conductor in Tundla railway section. The high-strength low-alloy steel developed at NML was successfully rolled to rounds and reinforced bars to meet the provisions of IS specifications. This steel has a versatile combination of high yield strength, ductility and weldability. The R&D work on the development of high-permeability nickel-iron alloys in the second phase of sponsored programme was progressing.

A large number of sponsored investigations on beneficiation and agglomeration studies on low-grade ores and minerals were conducted on behalf of public and private sector organizations like Rourkela Steel Plant; Vishakapatnam Steel Project; Metallurgical and Engineering Consultants (India) Ltd (MECON); M.N. Dastur & Co.; Hindustan Zinc Ltd; Pyrites, Phosphates & Chemicals Ltd; Fertiliser Corporation of India; Geological Survey of India; Coal India Ltd; Maharashtra Minerals Corporation; and mining and geological departments of several states. At the instance of the Union Ministry of Steel

& Mines, NML undertook beneficiation, agglomeration and sintering of chromites and studies on manganese ores.

Different grades of creep-resistant steels were tested, evaluated and developed at the Central Creep Testing Facility of NML on behalf of Bharat Heavy Electricals Ltd, Reactor Research Centre, Kalpakkam, and other organizations. Bharat Heavy Electricals Ltd accepted these grades of steel and trial-ordered these steels. Problems relating to service failure of metals and alloys in boilers, power plants, and production units were increasingly referred to the laboratory for determining the causes of failure and for suggesting remedial measures.

To promote new industrial establishments, NML collaborated with MECON. Proposals were under way for setting up a graphite beneficiation plant in Kerala, electrolytic manganese and manganese dioxide plant in Orissa, and a magnesite plant in Salem. All these proposals were under various stages of negotiation. NML also provided consultancy to Rajasthan Graphite (P) Ltd, Calcutta, in the setting up of a graphite beneficiation plant in Rajasthan.

The United Nations Industrial Development Organisation (UNIDO) organized a consultation meeting on 'Adaptation of steel technology to the needs of the developing countries' at NML in November-December 1977. NML also participated in (i) get-together on 'Use of NML-PM2 aluminium alloy conductor in electrical industries', at Indore, organized by the Small Industries Service Institute; (ii) meeting of the state level R&D Committee for Bihar held at Dhanbad; and (iii) Indian Creep Panel Meeting for which NML holds the secretariat.

A monograph on 'Indian ores and minerals and their beneficiation studies' covering the investigations conducted in NML over the past two and half decades was published.

Eighty-three papers were published/presented in seminars and three patents were filed during the year. □

CSIR's EXTRAMURAL RESEARCH

Screening of Heterozygotes for Genetic Diseases

Genetic disorders in India are gaining greater prominence with reduction in mortality from diseases due to infective and environmental causes. Genetic counselling is developing into an important branch of medical services, as a part of family welfare.

The available information on genetic disorders is mainly based on case histories from city hospitals and results of surveys of small sub-populations. Although haemoglobinopathies have been relatively extensively studied, their correlation with different environmental factors and the genetic interaction between different genes have not been assessed fully. Reports of lipid and glycogen storage diseases are sporadic. The details regarding incidence of muscular dystrophies, though common, are not yet fully known.

In a CSIR research scheme sanctioned to her, Prof.(Mrs) Archana Sharma of the Department of Botany, University College of Science, University of Calcutta, Calcutta, proposes to continue the work done in an earlier project investigated by the group on the genetic variability of protein and chromosome banding patterns in normal amniotic fluid samples. In that project the group had set up parameters of the variability in normal samples. They had also identified heterozygotes for the HbE thalassaemia and β -thalassaemia by methods specially devised for the purpose.

In the present project it is proposed to scan the families of cases referred to the local hospitals which are identified as suffering from hereditary conditions, for heterozygotes. The work will be extended to disorders of both (a) chromosomal and (b) single or polygenic inheritance. Methods already available will be used for identifying the

carriers of heterozygotes in the families of affected cases.

The number of diseases of known genetic causes is progressively on the increase with the advent of the banding pattern techniques for identifying chromosomal changes and biochemical tests for genic changes involving clinical syndromes. In India, data on such conditions are scattered and attempts have been made to collect the available reports and correlate them with external factors by the group.

Detecting clinically normal heterozygotes is important not only for autosomal recessive and x-linked conditions, but also for dominant conditions of late onset. It is in fact for the latter two classes of conditions, the x-linked recessive and the dominant of late onset, that heterozygote detection will be of much value in individual families. Screening for genetic variation may serve one or more purposes. There is still the basic need for information about the frequency, natural history and inheritance of many genetic diseases. The same type of screening can help in supplying this information. In some circumstances specialized screening procedures or *in utero* diagnosis have widened the options available to persons at risk for untreatable genetic illness. Screening for the disease itself is not desirable as it often becomes too late to help the patient. The objective is to prevent pathological changes or, to recognize the disease at its incipient stage.

The work is of national importance since it will serve to identify the heterozygotes or carriers of a particular genetic disease. It will be essential in genetic counselling as the suspected carriers could be separated from the non-carriers who can lead a normal life. Families will be contacted and tests, both biochemical and cytochemical, will be performed to find out whether an individual is a carrier for the trait. A pedigree chart will be prepared for each family and the possibilities of inheritance in the carriers will be worked out. □

Thermal and Photodegradation of Polymeric Peroxides of Vinyl Polymers

At present the commercial application of many polymers is limited because of their inability to resist oxidative degradation. Because of thermal and photoradiations, bond breaking occurs in polymer molecules with the formation of free radicals which combine with atmospheric oxygen to form peroxides. By controlling the formation of peroxides the life-time of the polymers can be increased. This could be achieved by retarding the degradation of peroxides formed. For this a complete understanding of the degradation of polymeric peroxides, on which very little information is available, is essential.

In a CSIR research scheme granted to him, Dr K. Kishore, Assistant Professor, Indian Institute of Science, Bangalore, will investigate the degradation of polymeric peroxides to find out means by which degradation may be prevented. The project is important industrially as well as academically.

Following a study of (i) the kinetics and mechanism of thermal and photodegradations of polymeric peroxides, attempts will be made to develop a method to retard the thermal and photodegradation of vinyl polymers, based on mechanistic information. Studies will be carried out on polymeric peroxides of vinyl polymers like polystyrene peroxide, polymethylmethacrylate peroxide, and polyethylene peroxide. The effect of molecular weight, additives, temperature, environment, solvent, etc. will be examined. Studies on the ageing of these peroxides with and without additives will be carried out through short-term tests, based on which their long-term behaviour will be predicted.

Decomposition studies will be carried out using TG, DTA and DSC. Analysis of intermediary products will be done by microanalysis, IR, UV, NMR, mass spectral studies, and also by GPC, TLC, GLC, etc. Photodegradation studies

will be carried out in a special quartz or silica cell.

Shri K. Raveendran, a junior research fellow, is also associated with the project. □

A Genetic Approach to Improve Alkaloid Yield and Population Structure of Existing and Manipulated Gene Pools of *Catharanthus (Vinca)* Species

The genus *Catharanthus* (fam. Apocynaceae) has been identified as a potential source of many alkaloids having antitumour, antimalignant, antileukaemia, diuretic and hypnotic properties. The genus contains several wild and cultivated species showing variable alkaloid content, the majority of which has been found in the roots. Owing to this tremendous medicinal prospect of this genus, more and more attention is being paid for popularizing its commercial cultivation, although no significant genetic approach has been made to improve and manipulate its alkaloid content.

In a new CSIR research scheme granted to him, Dr K.K. Ghoshal of the Faculty of Agriculture, Bidhan Chandra Krishi Viswa Vidyalaya, Kalyani, attempts to improve genetically the alkaloid content of the *Catharanthus* species. As environment is supposed to exert a significant influence on the concentration of alkaloid in different ecotypes, genetic materials will be collected from different agro-climatic locations of the country to assess the variability in alkaloid content. A small scale fertilizer trial will also be conducted to determine the differences in alkaloid content in different ecotypes in relation to different nutritional status. Simultaneously, attempts will be made to collect all the known species under the genus and these will be subjected to screening tests for alkaloid content. In order to find out a suitable marker character for identifying genotypes with higher alkaloid content by usual observation, the correlation between alkaloid content and other quantitative

characters will be worked out. This will help in rapid screening for promising lines with higher alkaloid content in a large population.

The alkaloid enhancement attempts will be tackled from two angles:

(1) Induction of mutations to isolate 'types' having relative resistance to shattering habit of capsules and pronounced root development with higher alkaloid content. For this, treatments with both physical and chemical mutagens will be made and the mutants will be analyzed in subsequent generations to isolate types with non-shattering capsules and better plant type. If no improved type is obtained immediately, the mutants showing promise can be utilized in hybridization programmes involving mutant and original ecotypes.

(2) Intervarietal and, if possible, interspecific hybridizations will be made. Parents for hybridization programme will be selected on the basis of screening for better plant types and growth habit, relative resistance to shattering of capsules, pronounced root development and other quantitative characters, and obviously, higher alkaloid content. The hybrid generations will be subjected to selections for better types and the selected segregants will be further tested for higher alkaloid content. In continuation, alkaloid estimation of the segregates will be made to find out the scope for exploiting hybrid vigour in alkaloid production. The determination of an easy visual method for identification of higher alkaloid content through the establishment of correlation between some marker character and alkaloid content will be very helpful in screening a large segregating population. □

Fission Track Geochronology of the Porphyritic Granites of the Meghalaya Region

In a new CSIR research scheme granted to him, Dr K.M. Pathak, Reader in Physics, Gauhati University, Gauhati, proposes to investigate the geochro-

nology of the elder, crystalline rocks of the Meghalaya region. Among many later granite plutons available in the Meghalaya region, the Myllem granite, the South Khasi batholith, the Nongpoh granite and the Kolong granite are conspicuous and these occupy large areas. Though some competent authority postulated the age of formation of the rock to be Precambrian or Archean, none of these granites has been dated by modern techniques. It is therefore necessary to find the absolute age of the granites and to ascertain whether all of them belong to the same time or to different times and, if possible, to find the thermal history of the rocks.

Since the discovery of optical detection of the radiation damages produced by the passage of charged particles in solids, the fossil fission track method has been applied successfully by several workers for dating rock minerals.

Among the accessory minerals reported in the above porphyritic granites, apatite, sphene, epidote, allanite, zircon, biotite, etc. are dateable by the fission track method. But as apatite, sphene and biotite are abundant and common in these granites, these minerals will be studied in detail by the fission track method and the other minerals will also be studied to clarify certain chronological and paleothermometric doubts. □

Enzyme Immunoassay of Human Chorionic Gonadotrophin

Quantitation of nanogram quantities of hormones and other substances in body fluids is essential for diagnosing and managing many medical disorders. Radioimmunoassay (RIA) is ordinarily used for this purpose. However, procedures using radioisotopes suffer from the limitation of short shelf-life of reagents and requirements for expensive equipment to quantitate the radioisotopes. The use of radioisotopes also requires safeguards against biological hazards. Because of these, the

availability and use of RIA procedures has been limited in India, depriving the vast masses of the recent advances in the field of medicine.

The recent development of the enzyme immunoassay (EIA) technique, in which the enzyme is used as a marker in place of radioisotope, makes it possible to carry out the most sensitive and sophisticated tests easily. The enzyme conjugates have a long shelf-life and the enzymatic reactions can be monitored visually or quantitated by ordinary colorimeters. In developing countries there is need to replace RIA procedure with EIA procedures. This is the objective of a new CSIR research scheme on enzyme immunoassay of human chorionic gonadotrophin (HCG) granted to Dr S.S. Agarwal of the K.G. Medical College, Lucknow.

In spite of the advances in the field of enzyme immunoassay, this technique has not yet become sufficiently popular. One of the critical areas is the development of good-quality enzyme-antibody or enzyme-antigen conjugates. With this goal in view the investigator has chosen to standardize the enzyme immunoassay of HCG. The estimation of HCG is necessary for early diagnosis of pregnancy and for monitoring the course and treatment of hydatidiform mole and choriocarcinoma. The investigator also proposes to evaluate the role of HCG measurements in the monitoring of pregnancy. □

PERSONNEL NEWS

Appointments/Promotions

Promotions at the National Botanical Research Institute, Lucknow, consequent on assessment, include those of Shri S.L. Kapoor (as Scientist EI, 21 Aug. 1978), Dr P.S. Misra (as Scientist C, 1 Aug. 1977) and Shri S.N. Srivastava (as Scientist C, 15 Feb. 1978).

* * *

Shri C.A. Sastry, Scientist in charge of the Madras Zonal Laboratory of the National Environmental Engineering Research Institute (NEERI), Nagpur,

has been promoted as Scientist EII (6 Aug. 1979).

* * *

Shri A.K. Biswas has been appointed Scientist B at the Calcutta Zonal Laboratory of NEERI (23 July 1979).

Honours & Awards

Dr B.K. Bhat of the Regional Research Laboratory, Jammu, has been offered a research position by the University of Tasmania, Australia, to work on high-value, low-volume crops. Dr Bhat has done considerable work on agrotechnology and breeding of hops, and medicinal and essential oil bearing plants.

* * *

Dr S.K. Guha of the Central Glass & Ceramic Research Institute, Calcutta, has been nominated a member of the board of management of Bengal Potteries Limited, Calcutta, by the Industrial Reconstruction Corporation of India Limited, Calcutta.

Retirements

Shri Nau Nihal Singh, Chief (Administration), Council of Scientific and Industrial Research (CSIR), retired voluntarily on 28 September 1979.

Shri Nau Nihal Singh, who joined CSIR in August 1942, worked in various capacities, including those of Administrative Officer at several laboratories and Deputy Secretary, CSIR.

Shri Nau Nihal Singh was appointed Chief (Administration), CSIR, on 30 June 1976 [CN, 26 (1976), 102].

Shri K.C. Sundarachari, Deputy Secretary, CSIR Headquarters has taken over as the Chief (Administration). □

Management of Environment: International Seminar

The Dr A.K. Ganguly* Felicitation Committee of the Bhabha Atomic

*Retired Director, Chemical Group, Bhabha Atomic Research Centre, Bombay.

Research Centre, Bombay, will organize an international seminar on management of environment at Bombay during 11-15 February 1980. Co-sponsored by the Department of Atomic Energy, the Defence Research and Development Organization, the Council of Scientific & Industrial Research (through the National Institute of Oceanography, Goa), the Maharashtra Academy of Sciences, and the Society for Clean Environment, the seminar will discuss the ways and means to manage and maintain the environment and will be divided into the following areas: (i) Aquatic Environment: Management of pollutants and overexploitation of biological and geological resources; (ii) Climatic Changes: Natural and man-made, short- and long-range and their impact; (iii) Human Settlement and Habitat: Urbanization, deforestation, and exploitation of non-renewable earth resources; and (iv) Waste Management: Liquid, gaseous, and solids—originating from industrial and domestic wastes.

In addition to presentation of selected papers, special invited lectures by eminent scientists/technologists/industrialists, from India and abroad, will be arranged.

For registration of names and for other details one may contact: Dr B. Patel (Convener, Dr A.K. Ganguly Felicitation Committee), Health Physics Division, Bhabha Atomic Research Centre, Bombay 400085. □

PATENTS FILED

401/Del/79: An improved process for the purification and enrichment of low-grade molybdenite concentrates, A.K. Saha, S.R. Srinivasan, D.D. Akerkar & V.A. Altekar—NML, Jamshedpur. □

Errata

In CN, 29(1979), p.137 (lines 9-10), under 'All-India Coordinated Project on Complex Sulphide Ores Utilization', please read 'Indian Bureau of Mines' for 'International Business Machines'. The error is regretted. □



CSIR NEWS

A SEMI-MONTHLY HOUSE BULLETIN OF CSIR

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Unesco Course in Information Handling: Insdoc

A continuing education programme in information handling, sponsored by Unesco, was conducted by the Indian National Scientific Documentation Centre (Insdoc), New Delhi, from 10 to 22 September 1979. Eighteen persons working in middle-level positions in library and information systems from seven countries, viz. Bangladesh, Burma, India, Iran, Nepal, Pakistan and Sri Lanka, participated in the programme. The objective of the course was to give a broad overview of the current developments in the information field, indicating the future trends, with particular reference to the impact of technology. The course contents included topics in six areas, viz. Information flow and sources, Information systems and programmes, Information processing and organization, Information products and services, Information technology, and Management of information centres/systems. The course faculty was drawn from expertise available at Insdoc; Publications & Information Directorate, New Delhi; Documentation Research and Training Centre, Bangalore; Delhi University's Department of Library Science; Department of Science and Technology, and others.

The course was inaugurated by Prof. N.D. Mariwala, Chairman and Managing Director, National Industrial Development Corporation, New Delhi, on 10 September 1979. Prof. B.S. Kesavan (former Director of Insdoc)

gave the keynote address. The course terminated on 22 September 1979 with a valedictory address by Prof. A. Rahman, Chief (Planning), and Head, Centre for the Study of Science, Technology and Development, CSIR, and distribution of certificates to successful participants. □

NIO's Solar Still for Drinking Water from Sea

The National Institute of Oceanography (NIO), Goa, has developed a working model of a multi-surface solar still which can desalt saline water using solar energy at a negligible running cost.

The still is most suitable for use in those areas where fresh water supply is insufficient but saline water is available in plenty. Four litres of fresh water can be obtained per square meter of the still per day during bright sunny days and 1.5 litres during cloudy days.

The fresh water produced is free from bacteria and has no dissolved salts. A battery of stills can be set up depending upon the drinking water requirement and the available terrace area of the building.

The materials used for constructing the still are a cement concrete bottom slab, ordinary window glass panes, nylon threads and channels of galvanized iron sheet or stainless steel. The initial cost of construction of the still is about Rs 300 but it could be reduced with the prefabrication of its components.

Interested parties may contact Shri S.P. Anand, Scientist, National Institute of Oceanography, Dona Paula, Goa 403004. □

Chemical Additive for Iron Ore Beneficiation

The Regional Research Laboratory (RRL), Jorhat, has demonstrated the production of a chemical additive for iron ore beneficiation in a unit set up by Allied Resins & Chemicals Ltd, Calcutta. The demonstration was done successfully in three consecutive batches during June 1979. Earlier, RRL-Jorhat had demonstrated the process on a laboratory scale and transferred the process know-how to the firm. With the starting of the manufacture of the additive the Steel Authority of India will carry out trials on beneficiation of iron ores of the Barsua iron mine of the Rourkela Steel Plant. RRL-Jorhat will also participate in these trials. □

Potential for Agro-based Industries in Madhya Pradesh: CFTRI Survey

At the request of the Madhya Pradesh Agro-industries Development Corporation, the Central Food Technological Research Institute (CFTRI), Mysore, surveyed the resources and potential of four districts, viz. Khargone, Dewas, Durg and Raipur, in Madhya Pradesh and submitted a techno-economic survey report on the scope for establishment of agro-based and allied industries. The survey covered the available resources including agriculture, livestock, fishery and forestry, the agro-climatic and infrastructural facilities, and the status of existing food and allied industries in the districts.

The survey has indicated the potential for launching about 160 industrial units

relating to the food produce of plant and animal origin, the inputs required and the economic and social benefits. The report is expected to serve as a ready reference for planning the economic development of the region. Process information on individual technologies available for setting up the units, with project economics and the availability of equipment and technology, are given in the report.

The report also suggests establishment of a food industries complex, to start with, in Dewas district. CFTRI has the expertise to provide the technical assistance. The laboratory has been assisting the Technical Consultancy Services Organisation (TECSOK), Directorate of Industries & Commerce, Government of Karnataka, in setting up a food industries complex at Mysore.

The services provided by the laboratory in such cases include: supply of technical information and know-how, preparation of detailed project reports, advice on plant location and layout and building-space requirement, assistance to the management of the complex in the selection, inspection, erection and commissioning of equipment, and assistance to entrepreneurs by way of training of technical personnel, purchase of raw material testing of products, etc. □

Storage Proteins in Chickpea and Horsegram: Isolation and Characterization

Studies on isolation and characterization of the storage proteins of chickpea (*Cicer arietinum*) horsegram (*Dolichos biflorus*) were carried out by Shri K. Ganesh Kumar, a CSIR senior research fellow working at the Central Food Technological Research Institute (CFTRI), Mysore. Changes in the protein components of these two legumes during germination were assayed by biochemical and physicochemical techniques. In chickpea, three major fractions with $s_{20,w}$ values 2.2, 6.9, and 10.3 were isolated. The 10.3

S fraction was the major fraction contributing about 50% of the total protein; a homogeneous fraction could be prepared. No proteolytic or trypsin inhibitor activity was associated with the fraction. The molecular weight of the protein was 2,76,000 daltons with at least five subunits.

The intrinsic viscosity of this protein was 0.054 dl/g with the absorption maxima at 278 nm and a fluorescence emission at 320 nm. It had one free -SH group and three S-S bonds per mole of protein. This protein fraction was found in the protein bodies of the cotyledons.

Urea dissociation occurred in two stages during germination. At a period of 12 days, initially the degradation was maximum in 6.9 S fraction while at the latter stages of germination 10.3 S fraction was degraded faster. By various physicochemical techniques it was found that the net charge of the protein fractions altered during germination. Hydrodynamic studies also suggested the symmetry of the 10.3 S protein.

In horsegram, five fractions were found of which the major fraction was a glycoprotein contributing to 60% of the total protein with a $s_{20,w}$ value of 5.8 S. This protein had no associated proteolytic, trypsin inhibitor and hemagglutinin activity. It had an intrinsic viscosity of 0.27 dl/g with the molecular weight of 1,50,000 daltons with at least five subunits.

This glycoprotein had one free -SH group and four S-S bonds, and was located in the protein bodies of the cotyledons. During 4-day germination periods, cotyledonary protein was depleted by 50%. The germination-modified fraction showed an increase in elution constant. The hydrodynamic and other optical methods did not show any detectable change in the conformation of the 5.8 S protein during 4-day germination periods.

Based on this, a hypothetical model for the utilization of the storage protein during the seed germination was proposed. In this model, prior hydrolysis of the conjugated proteins, deamidation and regular loss of

secondary and tertiary structures of the proteins were described. The applicability of this model to germinated chickpea and horsegram protein was also considered.

For his thesis based on these studies Shri Ganesh Kumar was awarded Ph.D. degree of the Mysore University. The work was carried out under the guidance of Dr L.V. Venkataraman of CFTRI. □

PROGRESS REPORTS

CECRI Annual Report: 1978-79

The Central Electrochemical Research Institute (CECRI), Karaikudi, has published its annual report for 1978-79. The report shows that the CECRI processes on calcium gluconate, detinning of tin scraps, rust converter, magnesium silicon alloy, zinc from galvanizer's ash, perchlorates, lead dioxide anodes, and dry cells were commercialized by nine parties which obtained the process know-how through the National Research Development Corporation of India (NRDC). NRDC gave licences to various parties on the CECRI processes on chromate treatment of die cast zinc alloy, rust preventing composition, corrosion prevention in reinforced concrete and brick construction, portland cement coating for steel, acid inhibitor in solid form, zinc metal from byproduct zinc compounds, dry cells, rust converter, potassium and sodium bromates, potassium and sodium iodates, calcium silicide (Ca, 30%), and acid inhibitor for pickling. The processes on β -phenylethylamine, benzylamine, fluorescent marking ink and magnesium alloy anodes for cathodic protection were assigned to NRDC for release to industry. Consultancy services were rendered on coating of titanium substrate anodes and their installation in industrial-scale chlor-alkali mercury cells, survey of corrosion problems encountered in the factories, magnesium-silver chloride water activated batteries, anodic protection of

stainless steel heat exchangers handling hot sulphuric acid, and design and fabrication of 'on & off' controllers for diazotization. Technical advice was rendered to revive a sick unit for producing sodium aluminate.

An electrothermal process has been developed for the production of calcium silicide (containing 30 % Ca). The plant is capable of producing 27-30 kg of calcium silicide per batch with an operating duration of 3-3½ hr using 380 kVA arc furnace. Calcium silicide finds major application as a deoxidizing and desulphurizing agent in the iron and steel industry and as an inoculant in foundry casting. It also finds application in defence oriented industries. The estimated demand is 100-150 tonnes/annum. All the raw materials and equipment required for the process are available indigenously.

The laboratory has developed an electrolytic process for the production of benzylamine from benzonitrile. The advantages of the process are ease of isolation of the product in a highly pure state, elimination of the use of costly catalyst and high pressure reactors required in the conventional process, and lower cost of production compared to that in the conventional process. Benzylamine finds application as drug intermediate and corrosion inhibitor. The estimated demand for the chemical is about 30 tonnes/annum. All the raw materials required for the process are available indigenously.

The laboratory has also developed an electrolytic process for the production of β -phenylethylamine from benzyl cyanide. The advantages of the process are the same as those of the process for the production of benzylamine from benzonitrile. β -Phenylethylamine finds application as drug intermediate and corrosion inhibitor. The estimated demand for β -phenylethylamine is about 30 tonnes/annum.

CECRI has developed magnesium alloy anodes for cathodic protection. Cathodic protection offers almost complete protection to submerged and buried structures from corrosion. In this

technique, the structure is made the cathode with reference to external anode. The alloying ingredients are melted together and cast in different sizes and shapes according to requirements. At present, the demand (200 tonnes/annum) for this type of anode is met by imports only. Raw materials required, other than magnesium for the process, are available indigenously. Magnesium metal also will be indigenously available when its plant proposed by the Tamil Nadu Government is commissioned.

Fluorescent marking ink is another of the products for which CECRI has developed a process. The ink is harmless to skin and clothing, and the marking withstands several hand washings and stays for the necessary length of time for most of its applications. All the raw materials and equipment required for making the ink are available indigenously.

The laboratory prepared perchloric acid by reacting solid sodium perchlorate with concentrated hydrochloric acid. Preliminary experiments were carried out on 250 g scale. Samples of perchloric acid have been sent to some industrial units for evaluation.

Pellet type cadmium sulphide photovoltaic cells prepared by the laboratory have maintained an output of 280 mV and 4 μ A even up to one year. Layer type photovoltaic cell (cadmium sulphide layer sintered on a ceramic substrate) prepared by CECRI showed an output of 100 mV and 30 μ A at 80,000 lux sunlight and maintained the output for more than ninety days.

More than 3000 kg of magnesium metal were produced under a CSIR-Tamil Nadu Government joint venture. The effect of boron in bitterns (obtained from Tuticorin) on electrolysis of fused magnesium chloride (obtained from bitterns) was studied. Even prolonged additions of boron in 100 ppm range did not have any adverse effect on the current efficiency of the process. A procedure has been evolved to bring down the boron content of the bitterns by 50 %.

As in the previous year, the laboratory conducted refresher courses on 'Corrosion and its prevention', and 'Electroplating'.

Forty-five research papers and 13 review papers were published and 18 patents were filed. □

CSIR's EXTRAMURAL RESEARCH

Chromosomal Basic Proteins in Fish Spermatozoa

A new CSIR research scheme granted to Dr R.K. Mandal of Bose Institute, Calcutta, envisages the study of the nature, function and ecological significance of chromosomal basic proteins in fish spermatozoa. In all eukaryotic organisms, the genetic material DNA is present in the form of 'Chromatin' complex in which basic proteins form an important part. The basic proteins complexed with DNA in somatic cells are called histones. The basic proteins in some genetic cell nucleus, particularly in some fish sperm, are protamines which are much simpler than histones. The structural and functional role of histones are now being understood. But the function of protamines is little understood yet, although the history of research on protamine dates back to more than a hundred years.

A preliminary survey in the investigator's laboratory has indicated that protamine is present only in marine and estuarine fishes. The study has indicated the need for a wider survey of fish species, both marine and freshwater, belonging to different orders and families for the occurrence of protamines or histones in their sperm. The difference in the structural (as studied by differential extraction with salt solutions, dye-binding, nuclease digestion, electron microscopy, etc.) and functional stability (as studied by capacity to fertilize ovum and to act as template in *in vitro* RNA synthesis) of nucleohistone and nucleoprotamine sperm will help in understanding the structural and functional role of protamines in fish sperm. The occurrence of protamines or

histones in sperm in fish species will serve as markers to indicate their evolutionary origin. This knowledge is expected to have much implication in ecology and zoogeography of the present-day fishes. □

Synthetic Studies in Imidazole, Pyrimidine, Purine, Pteridine and Related Series

The isolation and characterization of 4(5)-aminoimidazole-5(4)-carboxamide (AICA) and subsequent evidence that AICA-ribotide and the succino derivative are important intermediates in the biosynthesis *de novo* of purine nucleotide have generated interest in imidazole and related series for potential antimetabolites as possible anticancer agents. In an investigation carried out by Dr A.K. Sen, Reader, Department of Pure Chemistry, Calcutta University, Calcutta, for devising a general method of synthesis of 4-amino-1-substituted imidazole-5-carboxamide, a Dimroth type rearrangement in the imidazole series was discerned. Dimroth rearrangement, involving apparent migration of an alkyl group from ring nitrogen of an heteroaromatic compound to an exocyclic nitrogen was observed in a number of heterocyclic systems. Synthetic routes involving novel rearrangement of 1,3-disubstituted-4-amino-5-carbamoylimidazolium toluene-*p*-sulphonate to the biologically important 4-substituted-amino-1-substituted-imidazole-5-carboxamide were developed. Evidences were presented to support that the ring opened and cyclized to give the desired products. This appeared to be the first example of Dimroth type rearrangement in the imidazole series. The generality of the method was established by the observation of a similar rearrangement wherein the imidazole nucleus is replaced by thiazole nucleus. Thus, the method led to the production of valuable compounds for making anticancer agents.

Further work on the line led to the development of a new general synthesis

of theobromine (and caffeine thereof) and related xanthines, many of which otherwise would have been very difficult to prepare.

Shri Sibdas Ray (1972-1975) and Shri Gautam Chattopadhyay (1974-1978), CSIR research fellows working in this project, were awarded Ph.D. degrees in chemistry of the Calcutta University in 1977 and 1979 respectively. The latter is continuing, as a CSIR post-doctoral fellow, work on potential anticancer agents.

In a new CSIR research scheme granted to him, Dr Sen proposes to extend this method of ring opening and recyclization to the synthesis of various heterocyclic systems of potential biological value. He expects to obtain a number of ring systems of potential value in cancer chemotherapy by choice of suitably substituted substrates. Dr Sen also proposes to study some other ring transformation reactions to obtain such compounds. □

Effect of Thermal Acclimation of Silk gland Metabolism in Eri Silkworm, *Philosamia ricini*

The compensatory responses of physiological and biochemical processes against thermal stress has been termed as 'thermal acclimation', and this has been well explained at different levels of organization in bacteria, plants, fishes, and amphibians but not in insects. However, the investigations made so far have indicated the capacity of thermal acclimatory responses in insects behaving like other temperature conforming animals.

Cold adaptation of insects results in increased protein accumulation and decreased amino acid content of hemolymph and tissues, increased apyrase activity in leg muscle, increased larval weight of *Bombyx mori*, etc. These findings and others led to the conclusion that an increase in protein level of tissues characterizes the phenomenon of cold acclimation of a wide variety of thermoconforming animals (poikilotherms). Therefore, similar com-

pensatory alterations in physiological and biochemical parameters can be anticipated in the silkworm—an insect of industrial importance. Hence, in a CSIR research scheme granted to Dr S.P. Singh of the Postgraduate Department of Zoology, Udai Pratap College, Varanasi, the investigator proposes to analyze the energetic and synthetic status of silk gland of eri silkworm, *Philosamia ricini*, after adaptation to low and high temperatures. Consequently, the findings may favour, if any, an increase in the amount of silk produced by the silk gland.

In accordance with the aim of the investigation, the silk gland of eri silkworms, adapted to low and high temperatures, will be extensively studied at molecular and enzymatic levels. These will concern the changes in macromolecular contents at steady states, particularly of protein, amino acid pool size, RNA and DNA, chromatographic separation and identification of amino acids and spectrophotometric analysis of a few individual amino acids responsible for fibroin synthesis in silk gland, electrophoretic separation and characterization of proteins in silk gland and study of the properties of silk fibre such as cocoon weight, silk content and proportion of sericin and fibroin in silk fibre. □

Corrosion Mechanism of Typical Commercial Glass Surfaces in Aqueous Medium

The mechanism of glass corrosion has not been fully understood. Further, most of the recent studies on corroded glass surfaces relate to non-durable, simple binary silicates, and commercial glasses are much more complex in composition. In a new CSIR scheme sanctioned to Dr M. Chakraborty and Dr S. Basu of Material Science Centre, Indian Institute of Technology, Kharagpur, the investigators propose to study the kinetics and mechanism of corrosion of typical commercial glasses exposed to aqueous solutions buffered at different pH values. The con-

centration of different glass constituents bleached out in solution will be estimated with microchemical and spectroscopic techniques (colorimetry, flamephotometry, atomic absorption spectroscopy). The concentration profile of different glass constituents within the bleached layer will be studied with an electron microprobe analyzer and infrared reflection spectroscopy. The following aspects of glass corrosion will be studied: (i) effect of glass composition, particularly the influence of multivalent ions like Ca^{2+} , Mg^{2+} , Al^{3+} and Zr^{4+} , on the mechanism of corrosion; and (ii) effect of time, temperature, pH and ionic strength of leached solution on the rate and mechanism of corrosion.

The study is expected to throw light on the science of glass corrosion, and help formulate more durable, newer glass compositions. These studies will also help in the preservation of glasses, particularly of high artistic values.

Prof. Amal Paul, an internationally known expert in this field, is adviser to this scheme.

Smt. Rajlakshmi Sen, who has joined this scheme as a junior research fellow, is studying the effects of different parameters on the extent of corrosion of typical commercial glass samples. □

Hot Corrosion of Some Industrially Important Super Alloys

In a CSIR research scheme granted to him, Dr A.U. Malik, Reader in Materials Science, Chemistry Section, Zakir Husain Engineering College, Aligarh Muslim University, Aligarh, carried out a detailed investigation on the effects of different concentrations of the ionic salts, viz. NaCl , MgCl_2 , Na_2SO_4 , MgSO_4 , Na_2CO_3 and MgCO_3 , on the hot corrosion of the industrially based super alloys (iron-base alloys and nimonic alloys) in the temperature range 600-1000°C for 8 hr. Steel strips were sprayed with the solutions of different concentrations of these salts and dried. The dried

specimens were weighed in silica boats and kept in a furnace at desired temperatures for oxidation studies.

Coal ash deposit corrosion of stainless steels was also carried out. Ash of the 9 samples of different grades of the Indian coal was analyzed by some advanced analytical techniques. The IR and X-ray patterns were taken; the patterns gave the different constituents (Na, K, Mg, Ca, S, Cl, V, etc.) present in the ash. The role of these constituents on oxidation of stainless steels was studied in the temperature range 800-1000°C for 8 and 24 hr. The steel specimens of 0.08-0.12 cm^3 were abraded with different grades of SiC papers and coated with the saturated slurry of these ashes dried in an oven at 80°C. The coated specimens were transferred to the silica boats and weighed. The weighed silica boats were kept in tube furnace, fabricated in the investigator's laboratory, maintained at desired temperatures. After the completion of the oxidation run, samples were allowed to cool, and weighed. The oxidation rate was ascertained by the difference between the two weights.

All steels showed a gradual increase in the oxidation rates with increasing S, Cl, Na, K, Mg, Ca and V contents. However, the amount of silica seemed to have a beneficial effect on the corrosion resistance of the steels. In general, decrease in oxidation rate occurred with increase in silica content.

Metallographic studies of the corroded and uncorroded specimens revealed differences between the microstructures of the corroded and uncorroded specimens. The micrographs of the corroded specimens showed the mode of penetration of these alkali and alkaline-earth trace elements, their interaction with the matrix rich in Fe, Cr and Ni, and the formation of protective scales on the surface of the steel.

The X-ray diffraction patterns of the scales of corroded samples revealed the presence of Fe, Cr and Ni silicates. These insoluble silicates seemed to provide protection against corrosion. This could be possible because of the formation of a glasslike protective film

by the interaction of silica, iron and chromium oxides.

A comparative study of the high-temperature oxidation of uncoated and ash-coated steels revealed the effectiveness of the coal ash as a protective material against corrosion.

Shri Sultan Ahmad, a research fellow, is also associated with the project. □

High-Temperature Solubilities of Transition Metal Oxides in Alkali and Alkaline Earth Metal Carbonates and Sulphates

In a CSIR research scheme granted to him, Dr A.U. Malik, Reader in Materials Science, Chemistry Section, Zakir Husain Engineering College, Aligarh Muslim University, Aligarh, has been carrying out investigation on the high-temperature solubilities of transition metal oxides in alkali and alkaline earth metal carbonates.

Dr Malik has fabricated a high-temperature potential cell for the experiments. A high-temperature conductivity cell is also being fabricated for the determination of the solubilities of the transition metal oxides in fused Na_2CO_3 , NaCl , Na_2SO_4 , MgCl_2 , MgSO_4 and MgCO_3 in the temperature range 500-1000°C. The alkali and alkaline-earth chloride, carbonate and sulphates were mixed with transition metal oxides, e.g. Cr_2O_3 , TiO_2 , Fe_2O_3 and NiO , in different proportions and prepared in the form of tablets using a hydraulic press. The electrodes are $\text{ZrO}_2 + \text{CaO}$ and platinum wire as reference and indicator electrodes respectively. The measurements were carried out at 600°, 650° and 700°C.

Some hot corrosion studies on nickel base alloys (nimonic alloys) and iron base alloys (austenitic stainless steels) were carried out in the presence of Na_2CO_3 , NaCl , MgCl_2 , MgSO_4 , Na_2SO_4 and MgCO_3 in the temperature range 600-850°C and the data from hot corrosion were correlated with the data obtained from the solubility studies.

Some coatings of silicates, chromates, borates and zirconates were prepared on

steel and their oxidation and corrosion studies were carried out in the temperature range 600-1000°C. Hot corrosion studies were carried out in the presence of alkali and alkaline-earth chlorides, sulphates and carbonates. The results obtained are to be correlated with the solubility of transition metal oxides.

Dr. Malik carried out metallographic studies of the hot corroded alloys to examine the effect of alkali and alkaline-earth salts on alloy matrix rich in Fe, Cr, Ni and Ti (depending upon the nature of the alloy). The micrographs gave detailed information about the extent of the penetration of the salts, their interaction with the matrix and the nature of the newly formed constituents.

Debye Scherrer X-ray diffraction patterns were used to identify the constituents present in the fusion products (obtained from solubility and hot corrosion studies).

The recent use of silver(I) and copper(I) halides and compounds based on them in high-energy battery systems has prompted Dr Malik to carry out these investigations.

Some studies on the solubilities of these halides in the presence of alkali metal halides were carried out. The enhanced solubility of these insoluble salts was attributed to the formation of complex species in solution. The solubilities were determined by various analytical techniques. ^{110}Ag isotope activity measurements were made use of in those cases where solubilities were very low. Phase rule was applied to the solubility studies of Ag(I) and Cu(I) halides.

Shri Sharif Ahmad and Shri Zahoor Hadi, two research fellows, are also associated with the project. □

Optimization of Process Variables in Oil Agglomeration Process

A major problem faced by coal industry in India is the development of a suitable process for beneficiation of coal fines. Scarcity of good-grade coking coals makes it imperative that poorer quality

coals are beneficiated by suitable means for use in steel plants and other metallurgical purposes. Coal fines can be beneficiated by the oil agglomeration process and Batac jig. While Batac jig has been successfully adopted, the oil agglomeration process is still in the development stage. In a new CSIR scheme, it is proposed to study the effect of physical variables on the efficiency of the agglomeration process. The conditions for the process will be optimized so that industry could utilize the process profitably.

The work will be carried out by Dr T.C. Rao and Shri P. Bandopadhyay of the Indian School of Mines, Dhanbad, and Shri G.G. Sarkar of the Central Fuel Research Institute, Dhanbad.

The work proposed will involve: (i) characterization of coal fines: characteristics of impurities, size composition, and liberation characteristics; (ii) process optimization: effects of pH, pulp density, particle size, change of reagents, different doses of reagents and oil dispersion; and (iii) model development: development of a mechanistic model for the process, and study of its applicability on plant investigations. □

PATENTS INFORMATION

Indian Pat. 70/Del/77*

Improvements in or relating to the preparation of *o*-isopropylphenols

K.J. DIVAKAR, V.V. DHEKNE, (MRS) B.S. KULKARNI & A.S. RAO

National Chemical Laboratory, Pune

This invention provides a convenient route for the preparation of *o*-isopropylphenols.

o-Isopropylphenol is usually prepared by isopropylation of phenol with isopropanol or propylene in the presence of an acid catalyst. However, *p*-isopropylphenol, isopropylphenyl ether and diisopropylphenols are formed along with *o*-isopropylphenol.

It has been observed that heating 4-methylcoumarin in ethanediol in the presence of sodium hydroxide furnishes *o*-isopropenylphenol. The method covered by this patent is better than the

*Accepted

route of Fries and Volk who converted 4-methylcoumarin to the corresponding coumaric acid by heating with alkali and subsequently pyrolyzed the coumaric acid to furnish *o*-isopropenylphenol. The yield of *o*-isopropenylphenol in Fries and Volk's method is only 30%. Moreover, there are considerable difficulties in manipulation, especially in the pyrolysis step. In the NCL process, 4-methylcoumarin is heated with alkali and the decarboxylation of the resulting hydroxy acid, which is not isolated, is brought about under alkaline conditions, thus minimizing the loss of the acid-sensitive *o*-isopropenylphenol. On hydrogenation, *o*-isopropenylphenol gives *o*-isopropylphenol.

When 4,7-dimethylcoumarin is heated in ethanediol in the presence of sodium hydroxide, 2-isopropenyl-5-methylphenol is formed. Hydrogenation of 2-isopropenyl-5-methylphenol furnishes thymol. Since 4,7-dimethylcoumarin can be prepared readily from *m*-cresol, the invention provides a convenient route for the transformation of *m*-cresol to thymol, which is used in pharmaceutical and other industries. □

PERSONNEL NEWS

Appointments/Promotions

Dr K.P. Agarwal

Dr K.P. Agarwal of the Central Drug Research Institute (CDRI), Lucknow, has been promoted, on assessment, Scientist EI with effect from 1 December 1978.

An M.Sc. from the Allahabad University, Dr Agarwal started his research career at the National Physical Laboratory, New Delhi, in 1952. Working in association with Dr Gurbaksh Singh on the chemistry of natural products, Agarwal isolated the alkaloid chaksine and established the structure of one of its degradation products, chaksinic acid, through synthesis, IR and UV studies and finally assigned the structure of the parent alkaloid. An earlier erroneously reported structure of scoparone was also

corrected and established through synthesis.

Dr Agarwal shifted to CDRI in 1957. During the course of his investigations on a number of medicinal plants, he isolated new triterpenes, such as myricadiol from *Myrica esculenta*, randialic acid A [19 (α)-hydroxyursolic acid] and randialic acid B [19-dehydroursolic acid] from *Randia dumetorium* and established their structures through degradative, UV, IR, NMR and mass spectral studies. While working on the complex problem of cyclodehydration of β -benzoylphenylisocrotonic acid, he discovered a novel 1:3-dipolar cycloaddition reaction identical with Diel's-Alder synthesis (1:4-cycloaddition). For providing the complete proof of the constitution of the dehydration product of β -benzoylphenylisocrotonic acid and several of its newly discovered dimerization products, Dr Agarwal made extensive use of IR, UV, NMR and mass spectrometric methods in association with deuterium labelling. He was awarded Ph.D. degree of the Banaras Hindu University in 1967.

Dr Agarwal has developed indigenous know-how for: Dapsone, furacin, furantoin, furazolidone, ephedrine, centpiperolone, pentamedine isothionate, orisul, sulphamethoxazole, α -methyl-DOPA, and sodium valproate. He has published 17 papers and has taken out a patent. □

Dr S.N. Chatterjee

Dr S.N. Chatterjee of the Central Drug Research Institute (CDRI), Lucknow, has been promoted, on assessment, as Scientist EI with effect from 1 December 1978.

Dr Chatterjee has been with CDRI since 1964, joining as Scientist B and becoming Scientist C in 1971 in the Endocrinology Division. Initially, he worked in a project aimed at developing antifertility drugs for uneconomic as well as useless animals and also for humans. He developed a device for intra-ovarian injection in large animals. Injections of CdCl_2 (also FeCl_3) so-

lution given with the help of this device could cause permanent sterilization of scrub cows by destroying their ovarian functions within 24 hr without any adverse effect.

Dr Chatterjee also worked as a co-investigator in an ICMR (Indian Council of Medical Research) scheme on testicular physiology in dogs after vasectomy and recanalization. In his research on antifertility agents, Dr Chatterjee has screened 66 synthetic agents and 26 plant extracts for their anti-implantation and abortifacient activities. Two plant extracts were found by him to be 100% active for anti-implantation at 200 mg/kg body weight.

Some of Dr Chatterjee's present research interests are: artificial semen collection, semen studies and artificial breeding of Rhesus monkeys with the aim of developing a healthy, docile and well-acclimatized monkey colony to fulfil the growing need of ideal experimental sub-human primates. Dr Chatterjee has developed a simplified method for artificial semen collection in Rhesus monkeys and a diluter for preserving monkey semen for artificial insemination.

Dr Chatterjee (born 2 July 1921) did his G.V.Sc. (Government of Bengal) in 1943, postgraduate diploma course in advanced animal husbandry (1947-48) and associateship in animal reproduction (1978) from the Indian Veterinary Research Institute (IVRI), Izatnagar. He worked as a research assistant (1949-1955) in the Animal Genetics Division of IVRI on physiology of reproduction in farm animals.

Dr Chatterjee was, from 1955 to 1964, Animal Husbandry Officer in Manipur; and Assistant Research Officer and subsequently Assistant Animal Gynaecologist at IVRI.

Dr Chatterjee has published 34 research papers, 2 review papers and a few popular science articles. □

Shri U.C. Borah

Shri U.C. Borah of the Regional Research Laboratory (RRL), Jorhat, has been appointed, on promotion,

Scientist EI with effect from 30 April 1979.

Shri Borah joined RRL, Jorhat, in December 1976 as Scientist C and since then he has been heading the General Engineering Division of the laboratory. At RRL, Shri Borah has developed an improved still for distillation of essential oil bearing plants, a crusher-cum-juice expeller, a slicing machine, a wood chipper and a number of other process equipment. Besides, he is intimately associated with the development of process know-how relating to pesticides, furfural, carbon black, fluidized bed combustion of coal, carbon black from coal and cement by vertical shaft kiln method.

Shri Borah (born 1 Feb. 1935) obtained his bacheolor's degree in mechanical engineering from the Jadavpur University, Calcutta, in 1958, and two-year post-graduate training in the design and manufacture of machine tools at two leading machine tool manufacturing firms in West Germany. He also worked as a research scholar in the machine tools laboratory of Techenische Hochschule Aachen for about six months. He obtained diploma in welding techniques from the German Society of Welding Engineers.

On his return to India, Shri Borah joined the Umiun Hydral Project of the Assam State Electricity Board, where he was responsible for the establishment of a modern general engineering workshop, and management and maintenance of mechanical engineering services.

Shri Borah has earlier held positions as Assistant Professor in mechanical engineering at the Jorhat Engineering College, Jorhat; Principal of Polytechnic; Principal of HRH The Prince of Wales Institute of Engineering and Technology, Jorhat; and Joint Director of Technical Education, Assam.

Shri Borah is a member of the Institution of Engineers (India), and the Institution of German Engineers.

He has to his credit a number of papers and patents on machine tools and related areas. □

Shri Baldev Singh has assumed charge (1 Sep. 1979) of the post of Chief (Technology Utilization) at the CSIR Headquarters, New Delhi, on completion of his foreign assignment.

Honours & Awards

Dr A.G. Datta of the Indian Institute of Experimental Medicine, Calcutta, has been awarded the Bashambar Nath Chopra memorial lectureship award of the Indian National Science Academy, New Delhi, for his contribution to biological oxidation mechanism.

* * *

The Superconductivity Group of the National Physical Laboratory (NPL), New Delhi, has been selected for the A.N. Chatterjee Memorial Prize for 1977. The prize has been given by the Indian Cryogenics Council for the group's outstanding work in cryogenics instrumentation. The recipient team consisting of Dr A.V. Narlikar, Dr S.N. Ekbote, Shri B.V. Reddi, Shri S.P. Suri, Shri Y.P.S. Negi, Shri V.S. Yadav, Dr R.G. Sharma and Dr A.K. Gupta, developed expertise in design and fabrication of superconducting magnet system. These magnets can generate magnetic fields of up to 80 kOe. Such magnets are in much demand for a wide variety of applications including power generation, high-speed transportation, and nuclear, medical and plasma research.

* * *

A research paper entitled 'Quality control, packaging and storage of dehydrated foods' by Dr J.S. Pruthi, Project Coordinator at the Ludhiana Experiment Station of the Central Food Technological Research Institute (CFTRI), Mysore, won the K.U. Patel Memorial Award for the overall best paper in Vol. 32, of *Indian Food Packer* (1978). The award given by the All-India Food Preservers' Association, New Delhi, carries a cash of Rs 1000.

Miss Malima Ratna Tunga from Sri Lanka, a former student of M.Sc. (food

technology) at CFTRI, Shri G. Radha Krishniah Setty, Miss S. Saroja and Shri A.M. Nanjundaswamy of CFTRI won the Wakefield Award carrying a cash of Rs 1000 for their review paper 'Effect of processing on vitamins and minerals in fruits and vegetables' published in *Indian Food Packer* (1978).

These awards were presented at the annual general meeting of the All-India Food Preservers' Association held at Bangalore on 11 August 1979.

* * *

Shri Kotha Seshadri Sekharam, a CSIR senior research fellow working at CFTRI has been awarded two national prizes for his popular science books for children in Telugu and Hindi by the National Council of Educational Research and Training, New Delhi, for the year 1978. The prizes carry cash awards of Rs. 3000 and Rs2000 for the Telugu and the Hindi book respectively.

Shri Sekharam's 'Mana Chuttoo Vinta Mokkalu' (Telugu) deals with the plants around us and his 'Ped Poudhe hi Hame Ahar Dete Hain' (Hindi) depicts plants as the primary source of food.

CSIR Procedures Regarding Transfer of Technology

The Technology Utilisation Division of the Council of Scientific and Industrial Research, New Delhi, has brought out a document titled 'CSIR procedures regarding transfer of technology and related matters' (amended up to 31 August 1978). As the title indicates, the publication (demy 4to, Pp. 118) gives details of procedures for commercialization of CSIR processes/patents/design engineering know-how and the working arrangement between CSIR and the National Research Development Corporation of India for commercialization of processes, etc. The publication also gives the procedures for deputation of CSIR scientists to industrial firms for exploitation of CSIR processes, guidelines for consultancy service in CSIR laboratories and for budgeting and

accounting of funds received. Terms and conditions for CSIR's taking up R&D projects at the instance of the Defence Research and Development Organisation; conditions for distribution of investigator's share of premia/royalty/fee; NRDC guidelines for financial collaboration for setting up pilot plants, etc.; CSIR's patents procedures; and guidelines of charges to be levied for extending testing and analysis facilities—all these are also incorporated in the document. The relevant proformas are given in 16 appendixes.

Copies of the publication can be had from the Chief (Technology Utilisation), CSIR Headquarters, Rafi Marg, New Delhi 110001. □

Leather Week and Tanners' Get-together:CLRI

The annual Leather Week of the Central Leather Research Institute (CLRI), Madras, will be organized from 31 January to 6 February 1980. The main programme of the 'week' will be a tanners' get-together (1-4 Feb.) with the theme 'Yesterday, today and tomorrow of Indian leather and allied industries'. Other programmes are: international leather fair, fashion parades, practical demonstrations of CLRI processes and products, and a seminar on 'Technology transfer in leather and leather products'.

The scope of the discussion in the tanners' get-together will be: Session I—Programmes, policies, management aspects and perspective planning and drawing up of a blueprint for the development of the leather industry; Session II—Raw materials, auxiliaries and chemicals, machines, and personnel; Session III—Technological aspects; Session IV—CLRI's research programme; and Session V—Summing up of the deliberations.

Further details may be obtained from the conveners, 15th Tanners' Get-Together 1980, Central Leather Research Institute, Adyar, Madras 600020. □



CSIR NEWS

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R&D Management : Workshop at NEERI

The Management Development Unit of the CSIR's Planning Division conducted a workshop on R&D Management at the National Environmental Engineering Research Institute (NEERI), Nagpur, during 18-25 September 1979. Thirty-one scientists, who included the Director, divisional heads, project leaders and scientists in charge of NEERI's zonal laboratories, participated in the programme directed by Shri P.N. Chowdhury of the Planning Division.

The topics of the workshop were divided into three broad areas: (i) Social environment in which NEERI functions as an organization; (ii) Contours of project management—formulation, operational planning and execution of projects; and (iii) Behavioural problems impinging on leadership characteristics.

In the session concerning social relations of science, Prof. A. Rahman, Chief (Planning), and Head, Centre for the Study of Science, Technology and Development, CSIR, highlighted some of the significant worldwide historical factors which resulted in the accumulation of scientific and technological knowledge leading to new national, political, social and environmental awareness and aspirations. The workshop also had sessions on such topics as institution building in R&D; project management—an overview; and framework for project selection.

An exercise on project selection techniques was conducted with reference to one of NEERI's projects. Participants were divided into three groups and the solutions of the exercises conducted by

all the groups were nearly the same as solutions arrived at by the faculty members. Project planning and monitoring concepts were discussed in one of the sessions. Following the session on 'Network analysis', another exercise was conducted on an R&D project 'High rate settlers' of NEERI's Water Treatment Division. The solutions of the three groups, presented separately, were nearly the same and the correct ones. Sessions on monitoring and decision-making, R&D project budgeting, and R&D project costing were held and an exercise in project costing was conducted. An exhaustive discussion session on manpower planning at NEERI was initiated by Shri Chowdhury.

Prof. K. Prasad, Director (Personnel and Industrial Relations), Management Development Institute, New Delhi, took sessions on Time management and individual subjective setting, Role clarity and effective group formation, and Leadership style. Other sessions were concerned with: Effective communication, Work procedure, and Performance appraisal counselling and development.

The workshop recommended that (i) the project selection methods should be applied while taking up an R&D project in the laboratory, and (ii) PERT, CPM and network analysis techniques should be used in some of the major projects of the laboratory.

Dr B.B. Sundaresan, NEERI's Director, addressing the participants, said that it was through the application of modern management techniques and tools in all R&D efforts of the laboratory that optimum returns could be expected from the investments made

in the field of environmental engineering. He emphasized that while managing R&D work, attention had to be paid to human aspects of the researchers and other staff in order to create an environment conducive for carrying out successfully the R&D work of a laboratory. In this context Dr Sundaresan referred to the challenging tasks of NEERI which are expected to grow in dimensions in the years ahead. □

CGCRI Develops Zero-Expansion Transparent Glass-Ceramics

The Central Glass & Ceramic Research Institute (CGCRI), Calcutta, has developed, on laboratory scale, a transparent glass-ceramics which has zero thermal expansion within the temperature range 20-300°C. The glass is from high silica region of $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{SiO}_2$ system with minor amounts of alkali oxides, TiO_2 and ZrO_2 . On melting, the glass becomes transparent and pale amber in colour with a coefficient of thermal expansion of $40-60 \times 10^{-7}/^\circ\text{C}$. Thermal crystallization of the glass within the range of 700-850°C yielded ultra low-expansion ($\pm 1.0 \times 10^{-7}$ between 20 and 300°C) transparent glass-ceramics. The glass-ceramics has beta-quartz solid solution type crystals. The crystals are smaller than the wavelength of the visible light and have low bi-refringence. The difference between the refractive index of

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the residual glass in the glass-ceramics and that of the crystals is very small.

This type of transparent glass-ceramics with zero thermal expansion is suitable for making mirrors for astronomical reflecting telescopes. This glass-ceramics can be used with advantage as an image intensifier in passive devices employed in defence. □

Computer Training at NIO

A three-week computer training course on COBOL Programming organized jointly by the National Institute of Oceanography (NIO), Goa, and the Electronics Corporation of India Ltd (ECIL), Hyderabad, concluded on 4 September 1979. Twenty-nine candidates, including 13 from NIO, seven from outside agencies in Goa and nine unemployed graduates, participated in the programme.

Dr S.Z. Qasim, Director of the laboratory, who gave away the certificates to the successful candidates at the valedictory function, emphasized the need for conducting more such courses to make the best use of the computer facility available at NIO. □

Electronic Process Control Instrumentation for Sugar Industry

Under a grant-in-aid project funded by the Department of Electronics for the development of electronic process control instrumentation for sugar industry, the Central Electronics Engineering Research Institute (CEERI), Pilani, has developed electronic control instrumentation for two of the most critical stages in the sugar industry, viz. juice clarification and pan boiling. The National Sugar Institute, Kanpur, is paying attention to the sugar technology aspects and coordinating the testing of the instrumentation in some commercial sugar factories.

In the juice clarification stage, the automatic liming and pH control instrumentation continuously senses the pH of the sulphited juice and controls automatically the rate of flow of milk of

lime so as to keep the pH close to an optimum set value for clarification of juice. Field trials of the prototype units in some commercial sugar factories have shown that the control system maintains the pH with an accuracy far exceeding that in manual control (7.0 ± 0.15 vs 7.0 ± 0.8).

Such an accurate control of pH on sulphited juice indicated: (i) improvement in mud settling rates; (ii) reduction in CaO and MgO contents in the clarified juice; and (iii) rise in the pol content in the clarified juice. This is also expected to indirectly help in reducing the losses due to inversion.

Another important process stage where control instrumentation finds a very wide application is the vacuum pan boiling stage. One requires to monitor continuously the degree of supersaturation of the mother liquor and to assess the various critical stages in the pan boiling, viz. seeding, hardening, thinning and final pan dropping, and thereby control the boiling of the strike by regulating the feed of molasses/water. CEERI has developed an instrument, named Panometer, which monitors the ac resistivity of the boiling sugar massecuite in the pan. This is directly related to the degree of supersaturation of the mother liquor.

Field trials of prototype units of both instruments in some commercial sugar factories have indicated improvements in fuel economy (by reducing the boiling period by about 25%), uniformity in crystal size, and reduction in sugar losses.

Workshop

The laboratory organized a workshop on 'Electronic process control instrumentation for sugar industry' during 21-25 September 1979 at Pilani. Thirty-four senior technologists, engineers and experts from various sugar factories all over the country participated in the workshop which was inaugurated by the Rajasthan's minister of industries Shri Suryanarayan Choudhari. Among the experts were Dr N.A. Ramaiah, Director, National Sugar Institute, Kanpur; Shri J.P. Mukherjee

of J.P. Associates Pvt. Ltd, Poona; and Shri P.J. Manohar Rao, Additional Chief Director, Directorate of Sugar, Ministry of Agriculture & Irrigation, New Delhi, who gave keynote addresses and lectures on different technical aspects of the applications of electronic process control instrumentation in sugar industry. Dr G.N. Acharya, Deputy Director and Area Coordinator, CEERI, was the chief coordinator of the workshop and he also delivered a keynote address.

Laboratory demonstrations on (i) digital set-point proportional controller; (ii) automatic liming and pH control system; and (iii) panometer were arranged for the delegates.

In a panel discussion in the last session conducted under the chairmanship of Dr Amarjit Singh, Director, CEERI, the delegates deliberated on the role of electronic process control instrumentation and systems, particularly in the sugar industry, and identified the following areas in which instrumentation would be very valuable: (i) automatic lime feed control for juice clarification; (ii) pan boiling system (graining and massecuite boiling); and (iii) vacuum evaporators.

The workshop felt that electronic instrumentation was also desirable in the following areas: (i) electronic weighing system for juice, cut-cane and bagasse using a belt conveyor weighing system; (ii) automatic control of sulphur dioxide; (iii) juice flow control; (iv) vapour line juice heater (temperature); (v) treated juice heater (temperature); (vi) clear juice heater (temperature); (vii) crystallizers (temperature); (viii) sulphur burner (temperature); (ix) mill drives (solid state ac drives); (x) cane carrier (solid state ac drive for autocane); (xi) centrifuges (variable speed solid state ac drives); (xii) steam (flow); and (xiii) boiler feed water control (pH, conductivity).

There was a suggestion that recorders or digital printout systems may be introduced for recording the critical variables such as temperature, brix, flow, and pH.

The representatives of the sugar industry and the experts in the field also suggested that: (1) The possibility of introducing low-cost instrumentation in the Khandsari sugar factories should be explored; and (2) Hand-operated mechanical scrapers (semi-automatic type) should be used for scooping out the pulp after slitting the cane into two halves so as to achieve effective saving of energy in crushing, milling, etc., and better clarification efficiency. □

Integrated Rural Development: CECRI

Under an integrated rural development programme launched by the Ramnad District Collector at Kundrakkudi and Nemam, two villages were adopted by some scientists of the Central Electrochemical Research Institute (CECRI), Karaikudi. These villages have attained self-sufficiency in one year. □

Baker's Yeast: Feasibility Report

The Central Food Technological Research Institute, (CFTRI), Mysore, has prepared a project feasibility report on the manufacture of baker's yeast for the Bihar State Pharmaceutical and Chemical Development Corporation, Patna. The report provides information on the technical feasibility and economic viability of the manufacturing process evolved by the laboratory.

Wet-compressed yeast or dried yeast cells, used as a leavening agent in the preparation of various bakery products, are in short supply in the country. There are five units in the country with an annual installed capacity for manufacturing 2500 tonnes of baker's yeast, but this is not sufficient to meet the growing need of the bakery industry.

The wet-compressed baker's yeast manufactured by the CFTRI process from molasses conforms to the IS specifications. The fixed investments for a unit of one tonne per day capacity would be around Rs 50 lakh.

The process know-how is available from the National Research

Development Corporation of India, New Delhi, on payment of a lump-sum premium of Rs 5000 plus a recurring royalty of 2.5 % on sales. The licence will be issued for a period of 10 years on a non-exclusive basis. □

CSIR's EXTRAMURAL RESEARCH

Cooking Quality of Rice

The acceptance of a food product depends mainly on its appearance, texture, taste and aroma. Keeping these factors in view, Shri N. Ramarathnam, a CSIR research fellow, working at the Department of Chemical Technology, Bombay University, Bombay, under the guidance of Dr P.K. Kulkarni undertook texture evaluation of cooked rice grains by instrumentation techniques and characterization of flavour components in scented rice varieties. Some of the fine varieties of rice are priced for their characteristic aroma in addition to their good cooking qualities. Since no attempt has been made to characterize the components responsible for the aroma, Shri Ramarathnam has attempted to isolate and identify the compounds, using the commercially available Basmati rice variety. A solvent extraction technique using a minimum amount of solvent and reaching to a maximum recovery of flavour components, is being developed.

Cooking quality of rice has been so far expressed in terms of loss of solids on cooling, increase in length and breadth of cooked grains, water uptake capacity, changes in viscosity, etc. Attempts are being made by the investigator to provide an efficient and useful index to determine the quality of cooked rice. The texture of cooked rice will be determined by using Instron testing machine and a texturometer, which will be designed and fabricated. □

A Planar Helical Slow-Wave Structure

One of the most important slow-wave structures is the conducting helix. The helix of circular cross-section has been

used in a variety of applications such as travelling-wave tubes, backward-wave oscillators, broadband antennas, leaky-wave antennas, delay lines, and phase shifters.

Notwithstanding its wide use, the common helix suffers from limitations such as difficulty in fabrication and low thermal capacity. While certain methods have been adopted to improve the thermal properties of the circular helix, it becomes more and more difficult to fabricate the helix as one approaches higher microwave frequencies.

Compared to the usual circular helix, a helical structure in planar geometry will have a number of favourable aspects. A planar version of helix would lead to an increase in the transverse size which should prove very helpful at smaller wavelengths. Above all, it could be fabricated easily with photolithographic techniques. Once standardized, this technique is expected to lead to low cost and reliable production of an optimized design.

It has been seen that the slow-wave property of a circular helix can be simulated, in principle, by a pair of unidirectionally conducting screens. It follows that it should be possible to use this 'planar helix' in some of the applications where a conventional helix has been in use. In a new CSIR research scheme granted to him, Dr R.K. Arora of the Department of Electrical Engineering, Indian Institute of Technology, Delhi, proposes to study the possibility of using the planar helix for travelling-wave tube applications.

The investigation is expected to lead to the development of a new microwave slow-wave structure of potentially wide applications. Since the planar helix has some unique waveguiding properties, certain advantages in the fabrication of devices such as travelling-wave tubes and other planar slow-wave structures are also indicated. □

Photoacoustic Spectroscopy of Solid and Gaseous Materials

Photoacoustic spectroscopy is a powerful technique for the investigation of

properties of matter in solid, liquid and gas phases. In this technique, heat produced by the radiationless relaxation processes which occur following the absorption of electromagnetic radiation is detected as a change in pressure. For samples in the solid or liquid phase, a coupling gas is usually required for detecting the pressure variations, but for gaseous samples it is not necessary. If the intensity of the exciting source is modulated at acoustic frequencies, a microphone may be used as a convenient and sensitive pressure transducer. The magnitude of the heating effect and its time response are then related to the microphone signal amplitude and phase shift relative to the modulating waveform. The technique has proved extremely valuable in obtaining quantitative as well as qualitative information about the optical absorption and the radiationless relaxations which are not available from conventional emission or absorption spectroscopy.

Photoacoustic spectroscopy is still in its formative stages. In a new CSIR research scheme granted to him, Dr S.N. Thakur of the Department of Physics, Banaras Hindu University, Varanasi, proposes to set up an experimental arrangement for investigating, by this method, the electronic spectra of aromatic aldehydes, and azabenzenes in the vapour phase. The investigator also intends to study some inorganic insulators both in powder and in crystalline form. Later, he proposes to study the crystalline, powder and amorphous semiconductors at low temperature and under increased resolution so as to obtain information about excitonic and other fine structures. □

PATENTS FILED

57/Del/79: A new process for bating of skins and hides by the use of immobilized pancreatic enzyme product, R. Puvanakrishnan, S. Bose & S.C. Dhar—CLRI, Madras.

276/Del/79: An electrochemical process for the production of 3-nitro-4-

hydroxytoluene from *p*-nitrotoluene, H.V.K. Udupa, S. Venkatachalapathy & S. Chidambaram—CECRI, Karaikudi.

494/Del/79: Closed circuit hydraulic prop, A.K. Datta, M.N. Tarafder, P.R. Roy & S. Bagchi—CMRS, Dhanbad.

555/Del/79: Improvements in or relating to the electro-deposition of zinc from acid and neutral baths, B.A. Shenoi & (Mrs) M. Pushpavanam—CECRI, Karaikudi.

554/Del/79: Improvements in or relating to a process for producing fuel ignitors—D.P. Agarwal & M.A. Masood—RRL, Hyderabad. □

Shanti Swarup Bhatnagar Prizes (1980) for Science & Technology

Nominations are invited for the Shanti Swarup Bhatnagar Prizes for the year 1980.

The prize, the highest and most coveted award conferred on the scientists and technologists in India, was instituted in 1957 by the Council of Scientific & Industrial Research (CSIR) in memory of its first Director and architect, the late Dr Shanti Swarup Bhatnagar, and is given each year for outstanding contributions in science including engineering and technology. The award is for research contributions made primarily in India during the five years preceding the year of the prize. Only scientists/technologists who are 45 years of age or less are eligible for consideration.

Five or more prizes, each of Rs 20,000, are awarded annually for notable and outstanding research, applied or fundamental, in the following disciplines: (1) Physical sciences; (2) Chemical sciences; (3) Biological sciences; (4) Mathematical sciences; (5) Engineering sciences; (6) Medical sciences; and (7) Other sciences.

To decide about the prizes, the Council invites and accepts nominations each year from the presidents of approved scientific societies of all-India character, vice chancellors of universities, deans of science, engineering

& technology, and medical faculties, directors of IITs, deans of faculties and heads of institutions deemed to be of university status, director general of major R&D organizations, such as DRDO, ICAR, ICMR, chairmen of AEC, UGC, Space Commission, ONGC, etc., directors of CSIR laboratories and BARC, TIFR, etc., and the Bhatnagar Prize awardees. University faculties should recommend persons working in their institutions only and route their nominations through their respective vice chancellors while the faculties in IITs should send their nominations through their directors. The directors of CSIR laboratories can nominate a candidate in the discipline of their interest, irrespective of whether he/she is working in CSIR laboratories or outside. Each Bhatnagar Prize awardee can send the nomination of one person for each years' award in his own discipline only. Each such nomination shall give detailed statement of work and attainments of the nominee, and a critical assessment report (not more than 500 words) bringing out the importance of the significant research and development contributions of the nominee made during 5 years preceding the year of the prize. Nominations from individuals sponsoring their own names or of others are not accepted.

Nominations may be sent (by registered post) along with ten copies of detailed statements of work and attainments of each nominee and the discipline under which the nominee is to be considered. The attainments of the nominee during the past 5 years may be highlighted, and sent along with at least one set of reprints of papers published during the 5-year period. The nominations signed by the sponsors should be sent in a sealed cover marked 'confidential' to the Head, Extra-Mural Research, CSIR, Rafi Marg, New Delhi 110001, and should reach CSIR latest by 31 March 1980.

The regulations governing the prize and the proforma for nomination may also be obtained from the Head, Extra-Mural Research, CSIR.



CSIR NEWS

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Workshop on Aerobiology : NBRI

Under an all-India coordinated project on aerobiology, a workshop sponsored jointly by the National Botanical Research Institute (NBRI), Lucknow, and the CSIR Centre for Biochemicals, Delhi, for offering training to the personnel associated with the project in the theory and practice of aerobiology with particular reference to the airborne pollen and fungal spores was held at NBRI, Lucknow, from 12 to 14 October 1979. Forty participants representing every state in India and covering the CSIR laboratories, the ICAR laboratories, the Botanical Survey of India and some other institutions attended the workshop.

Dr P.K.K. Nair of NBRI, in his welcome address, traced the growth of aerobiological studies in India and also explained the scope and aims of the project and its bearing on the twin problems of human allergy and plant pathogenicity. Dr Nitya Anand, Director, Central Drug Research Institute, Lucknow, and chairman of the coordination council for biological group of CSIR laboratories, inaugurating the workshop, complimented the coordinating institutions for organizing the workshop as a beginning to the experimental work which he considered to be of great national relevance. Dr A.P. Joshi, Scientist in charge, CSIR Centre for Biochemicals, threw light on the possibility of preparing new pollen antigens for immunotherapy of patients of allergy for every region in the country, on the basis of the pollen-spore calendars that are to be prepared at the end of the two-year atmospheric pollen-spore survey [CN, 29(1979), 137].

The inaugural session was followed by lectures by Dr M.K. Agrawal, (V.P. Chest Institute, Delhi) and Dr P.K.K. Nair on the fundamentals of the research problem being pursued. The second day was marked by a field trip to the NBRI gardens and to the forested and cultivated lands outside the city to give practical training to the participants in the mass collection of pollens. On the third day, laboratory demonstrations were given on the preparation of pollen and spore slides, the installation of the aeroscope (specially designed for the project and fabricated with the help of the Central Scientific Instruments Organisation, Chandigarh), and in the methodology of processing the data both with regard to the aero-spora and also with regard to the pollen and spores of the ground flora. □

Global Environmental Monitoring Systems Programme at NEERI

Under the Global Environmental Monitoring Systems (GEMS) programme, a 12-day regional training course on Water Quality Monitoring was organized at the National Environmental Engineering Research Institute (NEERI), Nagpur, from 22 October to 2 November 1979. Twenty scientists from seven south-east Asian countries participated in the course.

The GEMS programme is a follow-up of the recommendations of the first UN Conference on the Human Environment (Stockholm, 5-16 June

1972) which agreed on a Declaration on the Human Environment and worked out an action plan calling for (i) global environmental assessment; (ii) environmental management; and (iii) international measures to support the national and international actions of assessment and management. The GEMS programme was sponsored by UNEP/WHO to develop in every participating country the expertise required to administer and conduct water quality monitoring programmes and projects. NEERI conducted the course in collaboration with WHO.

The objectives of the GEMS programme are to: (i) establish a global network of monitoring stations at appropriate sites in rivers, lakes and aquifers (groundwaters); (ii) adopt uniform methodologies of water sampling and analysis; (iii) apply a continuing data quality assurance programme; (iv) develop and use a comprehensive data storage and retrieval system; (v) organize training courses for personnel engaged in all aspects of global water quality monitoring; (vi) prepare operators' manuals; and (vii) provide equipment in a limited number of cases.

The participating countries in the NEERI programme were Bangladesh, Burma, India, Indonesia, Nepal, Sri Lanka and Thailand. The participants were trained in network development, sampling methods, field measurements, laboratory procedures, data storage and retrieval, and multi-disciplinary aspects.

During the course, participants presented status reports on water quality monitoring in their countries. The participants were acquainted with statistical principles to evaluate the reliability of analytical data. The basic

components of the GEMS Water Quality Programme were reviewed during the course.

The course faculty was drawn from WHO (and its Regional Office at New Delhi), International School of Hydrology (University of Roorkee), Central Ground Water Board, and NEERI. □

Low-Temperature Zinc Phosphating Formulations

The Central Electrochemical Research Institute (CECRI), Karaikudi, has worked out a zinc-based phosphating formulation for carrying out phosphating at the temperature range 25 - 30°C within 10-15 min. By using this formulation the cost of phosphating can be brought down.

Phosphating finds a major application in the pretreatment of iron and steel surfaces before painting. At present, phosphating solutions operating at higher temperatures are used.

The present demand of phosphating solutions in the country is about 4 lakh litres.

Capital investment for a plant of 500 litres/day capacity is Rs 3.2 lakh and the cost of production is Rs 7.2/litre. The return on investment is expected to be 224%. □

CECRI Processes Demonstrated to Licencees

Two processes, viz. those for the production of (1) calcium gluconate and (2) potassium and sodium iodates, developed by the Central Electrochemical Research Institute (CECRI), Karaikudi, have been demonstrated to the licensees.

Calcium gluconate: The process for electrolytic production of calcium gluconate was demonstrated in 500 A cell to W.S. Dugal & Co. (P) Ltd, New Delhi, from 10 to 19 September 1979. A special feature of this technology is the use of rotating electrodes, which employ higher current density, leading to higher production per cell.

Calcium gluconate is used extensively in the treatment of calcium deficiency and in the manufacture of fruit jellies, baking powders, and homogeneous pastes like dentifrices.

Potassium and sodium iodates: The CECRI process for electrolytic production of potassium and sodium iodates from iodine was demonstrated in a 500 A cell to the licensee, Bush Boake Allen (I) Ltd, Madras, from 3 to 7 September 1979.

Iodate is widely used for iodization of salt and in the manufacture of dialdehyde starch. □

Storage Battery Technology: Refresher Course

The Central Electrochemical Research Institute, Karaikudi, conducted its 17th refresher course on 'Storage battery technology' for four weeks from 13 September 1979. Trainees from eight organizations attended the course. □

CSIR's EXTRAMURAL RESEARCH

Effect of Radioactive Hot-water Springs on Flora of Rajgir Hills

The hot-water springs of Rajgir have been found to be radioactive by the Atomic Energy Commission. Plants exposed to this radioactivity over a long period of time might have produced some interesting biotypes. A detailed study of the population biology of these biotypes would throw some light on the radiation resistance and buffering systems in these biotypes, effect of a mild but continuous exposure to radioactivity on the genetic make-up of the plant populations, and the rate and effect of mutations on plant populations.

Under a new CSIR research scheme granted to them Prof. R.P. Roy and Dr M.O. Siddiqui of the Department of Botany, Patna University, Patna, propose to study the effect of radioactive hot-water springs on the flora of

Rajgir Hills. Regular botanizing excursions will be made in the area with a view to studying its floristic composition. Special attention will be paid to record the species growing in the vicinity of the hot-water springs. A few such species, which flourish both near hot-water springs of Rajgir and in other parts of Patna District, will be selected for a detailed study.

Representative samples of the species selected will be collected both from hot-water springs and other suitable places in Patna. A detailed comparative study will be made on their morphological features, both qualitative and quantitative, using biometric methods. Distinctions, if any, between the two populations will be recorded.

A comparative study of both meiotic and mitotic chromosome composition and behaviour of the samples of the two populations will be made using staining techniques. C-banding karyograms of the two populations will also be attempted to uncover mitotic distinctions, if any.

Comparative and reciprocal transplant experiments, in which both clonal and seed propagation methods will be used, will be conducted on the samples collected from the two populations with a view to finding out whether the distinctions noted above are the results of ecotypic differentiation. Segregation ratios of these samples will be studied by using suitable breeding methods so as to understand the genetic control of the ecotypic differentiation.

An illustrated manual on the flora of this area would serve as a useful floristic guide to tourists, pilgrims and scientists both from India and abroad. □

Structural and Conformational Studies of Hydroxylamine Derivatives by X-ray Diffraction

In a new CSIR research scheme granted to him, Dr T.P. Singh of the Department of Physics, University of Indore, Indore, has undertaken studies on crystallization and X-ray structure determination of a series of hy-

droxylamine derivatives (analogues of the anti-cancer drug hydroxyureas), which inhibits DNA synthesis by destroying the active site of the enzyme ribonucleotide reductase. The preparation and structure determination of crystalline iron complexes of amino acids and/or short peptides as model compounds for the active site of ribonucleotide reductase have also been done. These studies will be supplemented by spectral and theoretical investigations.

Although the precise mechanism of their cytotoxic effects has not been defined, evidences suggest that hydroxyureas inhibit DNA synthesis without blocking the production of either RNA or protein. Interference with the enzymatic conversion of ribonucleotides to deoxyribonucleotides seems to be involved, but other sites of action have also been suspected. The structure-activity relationship of various hydroxylamine and hydroxamic acid derivatives with respect to their effects upon the biosynthesis of nucleic acids and protein has been studied extensively. However, the molecular

basis of their action is not yet clearly understood in most cases. Hence, it is proposed to systematically investigate the three-dimensional structures of these molecules and their complexes among themselves, with other biological molecules including amino acids, nucleic acid components and phospholipids.

The study involves preparation of crystals of individual hydroxylamine derivatives as well as of their complexes with amino acids or short peptides, and as model compounds for the active site of ribonucleotide reductase, followed by determination of the structural changes in hydroxylamine derivatives due to their association with the model compounds of the receptor sites by X-ray crystallography. The above data have been corroborated with results of studies involving spectroscopic and theoretical analysis to gain insight into the precise shapes, the possible non-covalent interactions and the changes introduced into the molecular geometry and the electronic structures of these compounds by molecular association with other compounds. □

PROCESS AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Cervical Dilator: Isaptent

The Central Drug Research Institute (CDRI), Lucknow, has developed a cervical dilator, Isaptent, an aid for termination of pregnancy and for gynaecological operations. The annual demand for cervical dilators is estimated at 5 lakh pieces.

Isaptent is a substitute for the imported laminaria tent. This item is not being manufactured in the country.

The CDRI process consists in granulating isapgol (*Plantago ovata*) seed husk and compressing it into cores of appropriate size and encapsulating the cores in a cloth tube either lined inside with a desired paper or coated with a thin film of microcrystalline cellulose. This is followed by compressing the tube, packing it in a glass or polythene tube and sterilization.

CDRI has made more than 3000 pieces of Isaptent and supplied them to several clinical centres for evaluation. The results of tests in more than 500 cases available so far show that a satisfactory degree of cervical dilation is achieved. Not a single failure has been reported. Psyllium seed husk has the property of swelling up at least 6 to 7 times the original bulk when it comes in contact with water. This property has been utilized for the preparation of the product. The gum present in the seed husk provides natural lubrication.

The main raw material is isapgol seed husk. About 500 kg of isapgol seed husk will be required to make 5 lakh dilators. Gum acacia, cellulose powder, fine cloth and cotton or polyester thread are also required.

A core making machine (electrically

operated), a sewing machine, ovens, an applicator for applying cellulose coating, cotton or polyester thread, a compressing machine and a gamma radiation equipment are the equipment required.

The suggested optimum plant capacity is 5000 dilators per day. A total capital investment of Rs 10 lakh would be required (fixed capital on building, Rs 2 lakh; capital on plant, Rs 3 lakh; and working capital, Rs 5 lakh). Land requirements for building and storage of raw materials are 10,000 ft² and 5000 ft². Cost of production is estimated at Re 1 per dilator.

Further particulars regarding this process (NRDC Process No. 797-01-9) can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024. □

Acrylic Resin Emulsion: Binder RS

The Central Leather Research Institute (CLRI), Madras, has developed a process for the preparation of an acrylic resin emulsion, designated as Binder RS. The emulsion is used as a binder in finished leather manufacture. It is an important chemical for leather auxiliary manufacturers. The demand in India for this binder is estimated to be 400-500 tonnes/annum; half of this demand is being met at present through indigenous production and the rest through imports.

The CLRI process is quite simple as it requires only a stainless steel reactor with stirring and heating facility. A mixture of acrylic monomers in aqueous media and persulphate, which is the catalyst, along with emulsions is copolymerized to obtain the acrylic resin emulsion.

The process has been developed on a laboratory scale and the product has received satisfactory acceptability from consumers like Calico Chemicals. The product conforms to IS specifications. Small quantities of the sample may be obtained from CLRI for assessment.

The main raw materials required are: acrylic ester monomers (commercial grade), potassium persulphate (pure grade) and emulsifiers (nonionic and anionic, commercial grade).

The raw materials are not indigenously available and have to be imported.

The main equipment is a stainless steel reactor with provision for delayed addition, stirring and heating. This can be easily fabricated indigenously.

The capacity of an economical unit is estimated at 500 kg of the emulsion per day (two shifts). The capital outlay for such a unit is as follows: fixed capital, Rs 1,15,000 (Rs 40,000 for building and Rs 75,000 for plant and machinery); and working capital, Rs 5,00,000. The cost of production is estimated at Rs 15/kg.

The process has a high profitability. No effluent or pollution problem is associated with the process. The plant is not power intensive and can be operated with a few people.

Further particulars regarding the process (NRDC Process No. 819-09-9) can be had from the Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024. □

PATENTS INFORMATION

Indian Pat. 76/Del/77*

Process for preparation of new yellow benzanthranyl triazine disperse dyes for synthetic fibres

N.R. AYYANGAR, R.J. LAHOTI & D.R. WAGLE
National Chemical Laboratory, Pune

This patent relates to a process for preparation of new yellow benzanthranyl triazine disperse dyes for synthetic fibres such as polyester fibre, for which they have good fastness properties. The yellow benzanthranyl triazine disperse dyes are prepared by the reaction of 3-aminobenzanthrone with cyanuric chloride to obtain 2-(3'-benzanthranyl-amino)-4,6-dichloro-1,3,5-triazine, followed by condensation of the reaction

product with excess of amines such as monomethylamine, monoethylamine, dimethylamine, diethylamine, methanol, ethanol, 2-methoxyethanol, 2-ethanolamine, *n*-butylamine, morpholine or piperidine. □

PATENTS FILED

342/Del/79: Improvements in or relating to a new computerized device for finding effective velocity from reversed reflection travel time data, K.L. Kaila & V. Gopalakrishna—NGRI, Hyderabad. □

Certificate of Merit in Printing to *Science ki Duniya*

Science ki Duniya, a popular science quarterly in Urdu published by the Publications & Information Directorate, New Delhi, has won a certificate of merit for excellence in printing and designing in the 20th national prize competition organized by the Directorate of Advertising and Visual Publicity, New Delhi. The magazine had won a similar award in 1977 also. □

Technology for Rural Health Care : Proceedings

The proceedings of the seminar on 'Technology for rural health care' organized at the Central Scientific Instruments Organisation (CSIO), Chandigarh, during 16-18 November 1978, have been published in *CSIO Communications*, Vol. 6, Nos. 1-3, Jan.-Sep. 1979. For copies of the publication one may write to the Editor, *CSIO Communications*, CSIO, Sector 30, Chandigarh 160020. □

PERSONNEL NEWS

Appointments/Promotions

Dr Gian Singh of the Publications & Information Directorate, New Delhi, has been appointed, on promotion, Scientist B (14 Nov. 1979).

Retirements

Shri T.S. Sodhi, Administrative Officer (Grade I), Indian National Scientific Documentation Centre

(Insdoc), New Delhi, retired (31 Oct. 1979).

Transfers

Shri Om Parkash has joined as Administrative Officer (Grade I) at Insdoc, New Delhi, on transfer from the National Institute of Oceanography, Goa (16 Nov. 1979). □

Workshop on Signal Processors for Engineering Applications

The National Aeronautical Laboratory (NAL), Bangalore, will organize, jointly with the Indian Institute of Science, Bangalore, a 3-day workshop on 'Signal processors for engineering applications' during 6-8 February 1980. The primary objective of the workshop is to present the basic and advanced concepts and application areas of analogue/digital signal processing for industrial and research problems in a systematic and comprehensive manner. The workshop will include a detailed presentation on new processing techniques with adequate theory, emphasizing both hardware and software aspects, and application of this information to a range of concrete design examples. Practical demonstration of systems simulating actual application is also included.

Scientists, engineers and manufacturers engaged in the development and utilization of signal processors from all over the country are being invited to participate in the workshop. The technical content of the workshop has been chosen to have a wide interdisciplinary base and deal with the state-of-the-art techniques. The registration fee for the workshop is Rs 400 per participant. Completed application forms should be received before 15 December 1979.

All correspondence in this regard may be addressed to the convenor, Shri C.S. Rangan, Head, Systems Engineering Division, National Aeronautical Laboratory, Post Bag 1779, Bangalore 560017. □

*Accepted.



Semi-automatic Multipoint Apparatus for Exciting Principal Modes of Vibration of Complex Structures

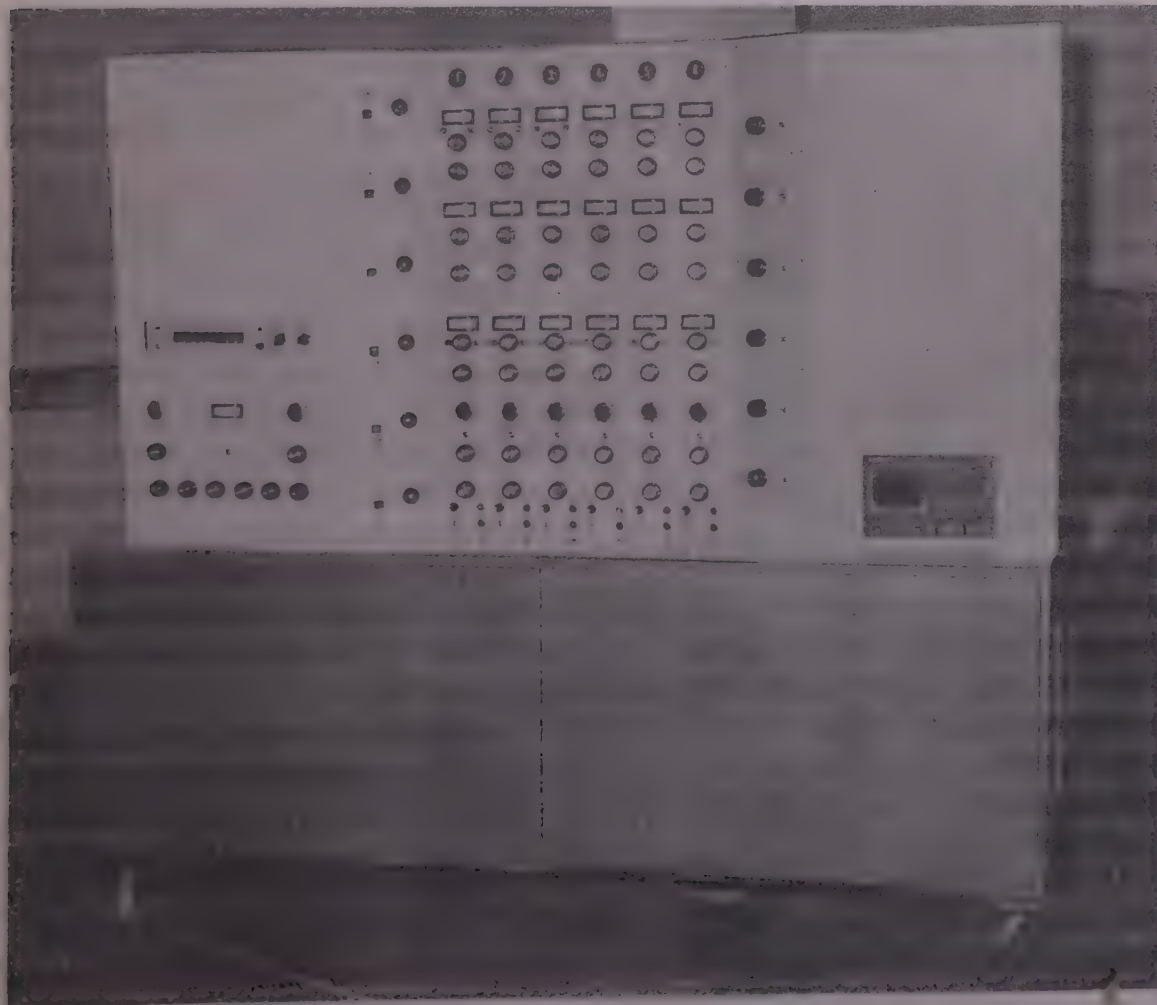
A knowledge of the principal modes of vibration of a structure is essential for the solution of vibration problems in structural dynamics. While the natural modes could be obtained experimentally in a ground resonance test, the main difficulty lies in exciting the undamped modes of a damped structure. The multipoint technique is one of the accepted techniques for the determination of natural frequencies, mode shapes and damping coefficients for different modes of vibration of the structure. In this method the structure is

excited simultaneously at a number of selected points, with controlled frequencies and forces so as to excite the chosen natural mode of vibration. Measurement of resonant frequencies, force distribution for each mode and mode shape gives the required data for the evaluation of dynamic characteristics of complex structures. Earlier, the National Aeronautical Laboratory (NAL), Bangalore, had developed a manual multipoint apparatus for generating the vibration characteristics of a complex structure. In that system

both the force and the frequency of excitation are adjusted manually by iterative procedure to vibrate the structure in a monophasic response.

Multipoint excitation is often employed as an attempt to force a complex damped structure to vibrate the principal modes, but finding the necessary distribution of force amplitudes is a long and tedious procedure. Therefore, a need was felt for a technique which would automatically find the required force distribution. But the experience in using a fully automatic system showed that automatic setting of force levels was often unnecessary. It was found that, provided there was automatic control of the excitation frequency, manual setting of the force distribution could be achieved by an iterative procedure with a little loss of time compared with a fully automatic system. It was also observed that with some structures it was impossible to achieve the required force and response relationships using a fully automatic system. In these cases, a semi-automatic multipoint apparatus is used to obtain a minimum error setting.

With this in view, a semi-automatic multipoint apparatus, with automatic control of frequency and manual control



Semi-automatic multipoint apparatus developed at NAL

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of force distribution was developed and fabricated at NAL.

The multipoint apparatus has the following specifications:

Frequency Loop	
Frequency	: 0-1 kHz in 3 ranges (10 turns dial setting)
Loop gain (select)	: High, medium, low
Output voltage	: 0-10 V
Phase shift (select)	: 0° or 180°
Phase demand	: 0-180° (10 turns dial)

Force loop	
Number of channels	: 6
Power amplifiers	
Output	: 40 W
Frequency range	: dc to 5 kHz
Output noise level	: 0.5 mV
Output distortion	: < 1%

Force control	
Fixed phase shift	: 0°-180°
Variable phase shift	: ~ ± 85°
Frequency range	: 5-1000 Hz

Force measurement	
Range	: 100 g - 100 kg (in 7 steps)
Frequency range	: 5-1000 Hz
Accuracy	: ± 1%
Max. phase error	: < 0.5° (at 5Hz)

Phase measurement	
Range	: 0°-180°
Resolution	: 4°

Response measurement	
Range acceleration	: 0.5 g - 500 g
Displacement	: 0.005 mil - 500 mils
Frequency	: 5-1000 Hz
Accuracy	: ± 1%
Calibration range	: 10 - 100 mV/g

The basic principle of operation of the system is that the phase difference between the structural response and the force input to the structure is compared with the demanded phase. Any deviation from the set demanded phase causes a change in voltage at the output of a servo-integrator and results in a change in frequency of the voltage-controlled oscillator, which drives the system. The forces applied to the structure by the exciter are adjusted manually. Once the level of the first exciter has been arbitrarily set, the frequency control servoloop maintains a

90° phase angle between the force input of that exciter and the acceleration response at the monitoring point on the structure. Iterative adjustments of force inputs are made with the force level controls until the required conditions are achieved.

The performance of the system has been tested at the laboratory. The experimental results obtained hitherto following intensive use of the unit in generating vibration characteristics of a typical aircraft wing have testified to its satisfactory functioning. □

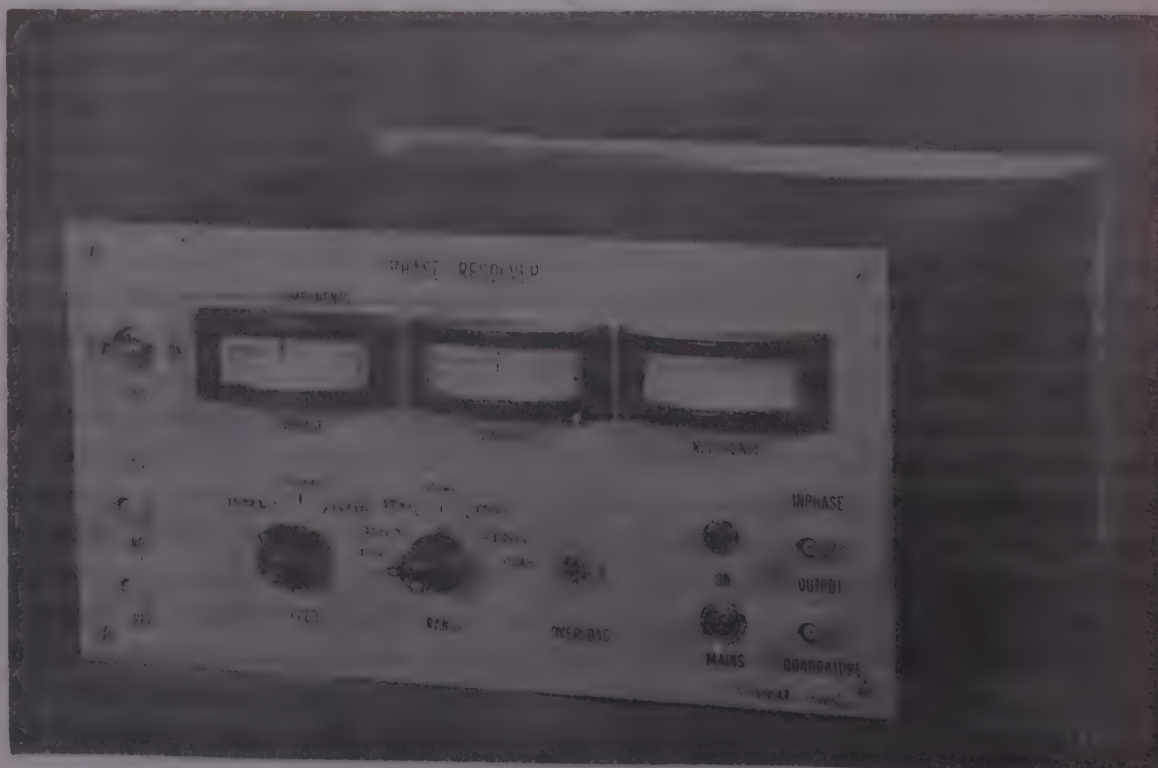
Phase Resolver for Generating Dynamic Characteristics of Structures

The National Aeronautical Laboratory (NAL), Bangalore, has developed a phase resolver that resolves the response into in-phase and quadrature components with respect to the reference input.

A knowledge of principal modes of a structure is frequently required to have an insight into their dynamic stability characteristics under various operating conditions. As structures are generally characterized by complex distribution of mass, stiffness and damping they

normally tend to have multiple modes of vibration. Experimental methods are invariably required to verify the results obtained by design calculations which are based on the mathematical models. Theoretical predictions are dependent to a large extent on the validity of assumptions regarding mass distribution, damping coefficients and boundary conditions.

Of the many methods available for the generation of vibration characteristics of complex structures the vectorial method suggested by Kannedy and Panchu (KP) is extensively used for dependable results. In this method, the structure is excited by a constant harmonic force, and the phase of the response signal with respect to the input force and the amplitude are measured. The result could be presented in the form of a vector from which the dynamic characteristics of the structure could be easily generated. The phase resolver is a practical solution to draw this vector diagram. The system developed at NAL provides simultaneous monitoring of reference input, in-phase component and quadrature component on panel meters. It also provides the simultaneous output voltage proportional to in-phase and quadrature components for X-Y recorder.



Phase resolver for generating dynamic characteristics of structures: NAL

The device has the following specifications:

Full scale range	: ± 9 mV to ± 9 V
Accuracy	: $\pm 2\%$ of full scale
Frequency/range	: 1.5 - 5 Hz
Reference input	:
Voltage	: 50 mV to 1 V
Power supply	: 230 V, 50 Hz

The phase resolver has been successfully used in the laboratory for generating the KP diagrams of practical aerospace structural components. □

Carboxin

The process for the manufacture of Carboxin, a systemic fungicide developed at the National Chemical Laboratory, Pune, has been released to Luxmi Traders, Calcutta, through the National Research Development Corporation of India.

Carboxin is used for the seed treatment of cereals against smuts and bunts and for the treatment of cotton, peanuts and vegetables against *Rhizoetonia*. This is a highly specific and effective fungicide against pathogens without causing injury to hosts. □

Nutritional and Biochemical Studies on Germinated Chickpea and Greengram

Studies on the biochemical changes occurring during germination in the major storage constituents, viz. carbohydrates, of chickpea (*Cicer arietinum*) and greengram (*Phaseolus aureus*) were made by Miss T.V. Jaya, senior research fellow, who worked at the Central Food Technological Research Institute, (CFTRI), Mysore. The effect of such germination modification on the overall nutritional quality of these legumes was also investigated.

Carbohydrate constituents of chickpea and greengram showed major quantitative and qualitative changes during germination. Amylase and diastase activity increased as germination progressed and amylase inhibitors were not detected in these two legumes.

Total carbohydrates and non-reducing sugars decreased, while pen-

tosans and reducing sugars increased with progressive stages of germination. About 65% of the ethanol-soluble sugars were in the form of oligosaccharides in chickpea and 35% in greengram. These oligosaccharides were rapidly broken down during germination with an increase in the concentration of monosaccharides and sucrose. An unidentified oligosaccharide, possibly ajugose, was present in both the legumes.

Starch was the major constituent contributing to 38-40% in both the legumes. During a germination period of 96 hr, about 40% of the chickpea and 60% of the greengram starches were hydrolyzed. Germination-modified (GM) starches showed decrease in intrinsic viscosity and increase in solubility and swelling power with an increase in amylose content compared to the ungerminated (UG) legume starches.

Among the unavailable carbohydrates, hemicellulose A fraction had more of hexoses, and hemicellulose B fraction had more of pentoses. Hemicellulose A and B fractions decreased during germination of greengram.

Germination improved the amylolysis of legume carbohydrates. β -Amylase action resulted in better digestibility than α -amylase. HCl-pepsin preincubation prior to the treatment with amylases improved the amylolysis significantly. Glucose, maltose, maltotriose and some maltodextrins were the breakdown products of α -amylolysis of starch. Maltose was the major hydrolytic product of β -amylase in starch.

Phytin P, pectins and divalent cations like Ca^{2+} and Mg^{2+} were found to affect the cookability of legumes. As these components undergo changes during germination, the cookability of germinated legumes was different from that of ungerminated ones. A combined interaction of these parameters expressed as 'PCMB number' was found to correlate with cooking time.

Nutritional aspects

Germination did not alter the protein quality of the two legumes as indicated

by growth and quantitative measurements. Chickpea [UG and germinated (G)] had a better protein efficiency ratio (PER), biological value (BV) and net protein utilization (NPU) than greengram (UG and G).

Cooking improved PER of chickpea and greengram but germination did not significantly improve PER of both the legumes. Germination did not show any improvement in BV while cooking reduced BV.

In cereal supplementation experiments with legumes, both UG and G gave better growth rates in rats when used in combination with rice or wheat. Supplementary effect was more pronounced when legumes were used with rice than with wheat. In both chickpea and greengram, no noticeable differences were found between UG and G in their characteristic of mutual supplementation.

The regeneration of serum proteins, liver proteins and liver enzymes was better when the repletion was done with chickpea (UG and G) than with greengram (UG and G) in protein depleted rats. The legume carbohydrates (UG and G) given with casein were effective in regenerating liver proteins as well as the activity of transferases and succinic dehydrogenase and serum proteins.

The protein concentrates prepared from these legumes were not very effective in regenerating protein in depleted rats. Germination did not alter the regenerating capacity of legumes. Both the legumes gave significant cholesterol lowering effect in liver and serum in hypercholesterolemia induced rats. Germinated legumes were more effective than UG ones in lowering cholesterol levels in rats. The activity of hepatic enzymes, viz. transferases, succinic dehydrogenase and glucose-6-phosphatase, was lowered with increase in serum and liver cholesterol level in rats.

In *in vivo* experiments using rats, chickpea produced more flatus than greengram, and cooking the legumes reduced the amount of flatus produced.

Germination of legumes did not reduce the flatus production in rats.

In the *in vitro* system using *Clostridium perfringens*, germinated legumes produced less flatus compared to the UG ones. Starch and the ethanol soluble fraction isolated from legumes (UG and G) stimulated gas produced by *Cl. perfringens*. Carbon dioxide was the primary component of flatus in legume based diets with lesser amounts of hydrogen, methane and oxygen.

For her thesis based on these studies Miss Jaya was awarded Ph.D. degree of the Mysore University. The work was carried out under the guidance of Dr L.V. Venkataraman of Central Food Technological Research Institute, Mysore. □

Structural and Electrical Properties of Franklinite and Related Oxides

Structural and electrical properties of franklinite (ZnFe_2O_4) and related oxides were studied by Shri D.M. Dharmadhikari of the National Environmental Engineering Research Institute (NEERI), Nagpur, through X-ray crystallographic investigations and resistivity measurements. Thermal analysis (DTA, DTG and TG) of some of the synthetic spinels was also carried out.

The naturally occurring franklinite from different countries has been found to contain Al^{3+} , Sc^{3+} and Ti^{4+} ions in addition to zinc and iron. The mineral franklinite has a spinel structure. It is a semiconductor and has potential use in the automobile exhaust and, in general, in the removal of the killer air-pollutant carbon monoxide.

Substituted franklinites were synthesized by replacing one of the Fe^{3+} ions in ZnFe_2O_4 by Al^{3+} , Sc^{3+} , Sm^{3+} and Y^{3+} ions in varying proportions and the series of compounds $\text{ZnFe}_{2-x}\text{M}_x\text{O}_4$, where $\text{M} = \text{Al}^{3+}$, Sc^{3+} , Sm^{3+} or Y^{3+} and $x = 0.2, 0.4, 0.6, 0.8$ or 1.0 , were studied. The role of Ti^{4+} , Ge^{4+} and

Zr^{4+} ions in the lattice of franklinite was studied by synthesizing a series of compounds $\text{ZnFe}_{2-x}\text{Zn}_{x/2}\text{Me}_{x/2}\text{O}_4$, where $\text{Me} = \text{Ti}^{4+}$, Ge^{4+} or Zr^{4+} , and $x = 0.2, 0.4, 0.6, 0.8$ or 1.0 .

X-ray diffraction studies showed that all the compounds in the systems $\text{ZnFe}_{2-x}\text{Al}_x\text{O}_4$, $\text{ZnFe}_{2-x}\text{Sc}_x\text{O}_4$ and $\text{ZnFe}_{2-x}\text{Zn}_{x/2}\text{Ti}_{x/2}\text{O}_4$ crystallize in the spinel structure. However, the compounds in the remaining systems crystallize in spinel structure up to a certain value of x . Structural studies of the substituted franklinites led to interesting results and synthesis of some new ternary spinels. The cation distribution of each system has been studied with reference to the chemical analysis of natural franklinites by electric microprobe analysis and neutron activation analysis, and also on the basis of the theoretical work of Dunitz and Orgel.

The dc-resistivity measurements showed that the resistivity of these compounds fell in the range of 10^3 - 10^{11} ohm-cm at room temperature. The resistivity of all the compounds synthesized was measured from room temperature to $650 \pm 20^\circ\text{K}$. The plot of $\log \rho$ vs $1/\tau$ for all the compounds showed that the resistivity fell in two different parts, i.e. the slope of the plot $\log \rho$ vs $1/\tau$ changes at high temperature. The electrical resistivity data and energy of activation of these compounds show that they are semiconductors.

The DTA curves of the compounds ZnFe_2O_4 , ZnFeScO_4 , ZnFeAlO_4 , $\text{ZnFeZn}_{0.5}\text{Ti}_{0.5}\text{O}_4$ and $\text{ZnFe}_{1.2}\text{Zn}_{0.4}\text{Ge}_{0.4}\text{O}_4$ showed exotherms between 580 and 655°K and endotherms between 1030 and 1140°K . The TG-curve of the above compounds showed a loss in weight at high temperature.

The substituted franklinites may find use in the treatment of automobile exhaust to minimize air-pollution.

Shri Dharmadhikari carried out these studies under the guidance of Prof. V.V. Deshpande of the Institute of Science, Nagpur, and was awarded Ph.D. degree by the Nagpur University, Nagpur, for his thesis based on the investigation. □

Conference Briefs

Shri A.S. Raizada of the Indian National Scientific Documentation Centre (INSDOC), New Delhi, participated, on an invitation from Unesco and International Council of Scientific Unions Abstracting Board (ICSU AB), in the meeting between the members of ICSU AB and experts from developing countries. The Unesco-sponsored meeting, held at Paris on 25-26 October 1979, discussed all facets of secondary information in science and technology in the developing countries, and the developed countries. Twenty-six participants, including the representatives of Abstracting Services like AGRIS Coordinating Centre (Rome) and BIOSIS and other members of ICSU AB, like the American Institute of Physics, National Academy of Sciences (USA) and the Pan American Health Organisation (Brazil), took part.

The meeting discussed the ways and means of improving the flow of secondary information in science and technology and its utilization not only in the developing countries but also in developed countries. The methodology of ensuring a continuous flow of information in science and technology emanating from the developing countries into the world abstracting and indexing services was also discussed. Members like the National Academy of Sciences and the American Institute of Physics expressed their willingness to provide support for this activity in the developing countries.

Shri Raizada, who presented a status report on the secondary information services in science and technology in India, stressed the need for organizing national abstracting and indexing services in those countries where such services do not exist, and to support such services in those countries where they already exist. The ICSU AB and Unesco, he urged, should provide the necessary support for developing a suitable infrastructure for setting up national abstracting services in developing countries where such services do not

exist. Considering the importance of the secondary information from the developing countries to the developed countries, the Indian delegate called for an immediate action plan of bringing primary literature in science and technology in the developing countries under bibliographical control. Towards this end, he suggested that Unesco should be approached to provide necessary help through their general information programme and UBC (Universal Bibliographic Control) activities. It is essential, he added, that the major abstracting services of the world should encourage and support a region-wise workshop on the secondary information for information handlers from developing countries. □

CSIR's EXTRAMURAL RESEARCH

Economic Dust Control Systems

The ore handling plant in Visakhapatnam handles millions of tonnes of iron ore. The loading and unloading operations at the rail terminal and ore conveyor release enormous amounts of dust, which poses health hazard to workers. With a view to evolving an economically feasible dust control system for eliminating health hazards, a CSIR sponsored project was investigated. The project, completed in February 1979, had also the objective of economic disposal of the collected dust as a raw material for various industries, and was investigated by Prof. C. Chiranjivi of the Department of Chemical Engineering, Andhra University, Waltair, in collaboration with the port authority.

In a detailed survey the concentrations of dust at various sampling points in and around the ore handling plant and also in several places in the town were measured. The dust concentration in most of the places was found to be below allowable limits. The dust concentration at the centre of the dumper house was 825 mg/m^3 air, and that at the periphery of the dumper

house was 25 mg/m^3 air. The concentration just outside the dumper house was well below the threshold limit. Even in the dumper house it could be reduced effectively by spraying water containing a wetting agent like MST.

On an examination of the various dust controlling methods reported so far, the use of a jet spray of finely divided

droplets of water together with an appropriate frother appears to be quite effective and economically viable besides being simple. Details of this mode of dust controlling are being investigated.

The port authorities were satisfied with the method suggested by the principal investigator of the scheme. □

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Digital Sound Level Meter

The Central Electronics Engineering Research Institute (CEERI), Pilani, has developed a digital sound level meter.

A sound level meter performs the function of measuring the pressures created by sound or noise. The threshold of human hearing corresponds to a standard pressure of $2 \times 10^{-4} \text{ dynes/cm}^2$ at 1000 Hz. Actual acoustic pressures are expressed in relation to this threshold as a ratio (in decibels). The sound level meter is used to measure sound/noise levels in auditoria, studios and industries. It is also used for estimating the noise levels of sound systems and in sound field survey.

The sound level meter designed by CEERI consists of a calibrated microphone, an amplifier, an attenuator network, a weighting network and an indicating meter. The microphone picks up the sound vibrations and converts them into an electrical signal. This signal is amplified and conditioned by subsequent circuits to yield a dc voltage proportional to the dB level of the sound. The voltage is applied to digital measuring/indicating circuits (of encoder/buffers-display units) so that the final dB value is indicated digitally. Active networks have been used to produce the weighting network characteristics. CEERI has assembled two prototypes which have been successfully tested in the laboratory.

The meter conforms to IS specifications 3932-1966.

The specifications of the sound level meter designed by CEERI are:

Sound level range	: 40-120 dB
Weighting network	: types A, B and C
Microphone	: omnidirectional electret type (sensitivity, 60 dB)
Display	: 3-digit LED (light emitting diode)
Power input	: 220 V ac, 1 phase, 50 Hz at 5 W
Dimensions	: $30 \times 15 \times 12 \text{ cm}$
Weight	: 4.25 kg

Bending machine, press, drilling machine, hand tools, soldering iron, etc. are needed for mechanical work and assembly. Test equipment required are: AF signal generator, oscilloscope, attenuator power supplies, ac millivoltmeter, and pulse generators. All these are available indigenously.

Microphones, resistors (including precision resistors), capacitors, inductors, transformers, diodes, transistors, integrated circuits (IC), light emitting diode (LED) display, printed circuit boards, chassis and hardware materials are needed. All these including the IC and the LED display are available indigenously though the latter is of imported origin.

For the manufacture of 60 pieces of the sound level meter a fixed capital (excluding land and building) of Rs 0.35 lakh and a working capital of Rs 0.60 lakh are needed.

The terms for the transfer of the know-how are: lump sum premium, Rs 10,000; recurring royalty, 0.5% on sales; nature of licence, non-exclusive; and period of licence, 5 years.

Further particulars regarding this design (NRDC Process No. 837-10-9) can be had from the Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024. □

Load Cells

The National Aeronautical Laboratory (NAL), Bangalore, has developed the design for a bonded wire strain gauge column type load cell for 10 tonnes compression loads. The load cell is a basic sensor in an electronic weighing system. It converts the strain due to a weight placed over it into an electrical signal. Usually the electrical output is low in magnitude and hence requires further electronic circuits for amplification. This magnified output can then be given to devices like printer and recorder to have the value of the weight marked on paper. The load cell, consequently, becomes an important aspect of electronic weighing systems for its accuracy, repeatability and reliability, specially in cases where heavy loads such as lorries, huge containers, railway wagons and tippers are to be weighed.

At present the load cells are mostly imported, though a few are being made indigenously. The load cell developed at NAL has better accuracy ($\pm 0.1\%$) than that ($\pm 0.5\%$) of the indigenous ones and compares favourably with imported ones. It is cheaper than imported and indigenous load cells.

The cell developed by NAL consists of a solid cylindrical steel billet as the load sensing element. The cross-section of the billet is 20 cm square on which four bakelitized wire strain gauges are bonded at the mid portion. Two of the gauges respond to the longitudinal strain and the other two are meant for Poisson ratio measurement. The assembled gauges are connected to form Wheatstone bridge. It is enclosed in a rugged mild steel jacket and is sealed for protection against atmospheric contaminations. Connections to and from the gauges are provided through a 5-pin

hermetic circular connector. The load cell has a sensitivity of 0.5 mV/V, which can be amplified by an external amplifier.

The load cell has the following specifications:

Load cell full range output	: 0.5 mV/V input (nominal)
Input and output resistance	: 600 ohms (nominal)
Operating temp. range	: 0°-40°C
Linearity and hysteresis	: 0.1 % R.O.
Overload capacity	: 100 % of the rated load

The laboratory has fabricated six load cells and these have been incorporated in the electronic weigh bridge system developed and supplied to a firm in Hyderabad. The system is functioning well.

The annual demand for load cells in the country is estimated to be about 500 pieces. However, the gap in demand will have to be ascertained by the interested entrepreneur before going into regular production.

The main equipment needed for the production of load cells are: milling machine, grinding facilities, furnace, oven, gauge bonding and testing arrangements, tools for soldering and for mechanical fabrication, digital multimeter, power supplies, etc. All are available indigenously.

The main raw materials needed are: EN24 steel, stainless steel, mild steel, aluminium rods and sheets, wire and foil strain gauges, electrical connector and hardware materials. All are available indigenously.

The total fixed capital excluding that required for land and building has been estimated at Rs 1.6 lakh and the cost of production will be about Rs 2300/load cell.

The terms for transfer of know-how are: lump sum premium, Rs 7000; recurring royalty, 3%; period of licence, 7 years; and nature of licence, nonexclusive.

Further particulars regarding this process (NRDC Process No. 805-03-9)

can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024. □

Herbicide for Control of Parthenium and Other Weeds

Many obnoxious weeds such as *Parthenium hysterophorus* pose a serious threat to agriculture, animal husbandry and dairy industry. Manual uprooting of parthenium is not only costly but it also causes dermatitis to allergic persons. The use of persistent herbicides is also not desirable because of their residual effects and consequential hazards to ecology, whereas short-lived herbicides tend to be ineffective. In both cases, the amount of herbicides applied is much in excess of the amount required for the control of the weeds because of the need to compensate the loss of herbicide by drifting, leaching, evaporation and decomposition. At present, formulations based on 2,4-D, such as Weedone-48, Weedar-96 and Fernoxone, are being used. Precise data on the demand for the product are not available.

In order to overcome the limitations mentioned above, the National Chemical Laboratory (NCL), Pune, has developed a novel, controlled-release, selective, pre-emergent and cheap herbicide formulation for the control of parthenium and other weeds. In this formulation a minimum dose of herbicide is released in a controlled manner at a fairly constant rate for a desired period of time with minimal threat to ecology. The NCL process involves the preparation of 2,4-dichlorophenoxyacetylchloride from 2,4-D and its treatment with a waste cellulosic material such as saw dust under suitable conditions. The technical material is suitably granulated. The new product has the following advantages over the 2,4-D formulations available in the market: (1) Quantity of active ingredient per acre is much less than in the conventional formulations;

(2) No repeat application is needed; (3) There are no drift hazards to adjoining crop; (4) It is more effective since translocation due to rains, etc. is minimum; (5) Since it is granulated, its application is easier; (6) It costs less; and (7) Many undesirable effects of 2,4-D are eliminated (germinating grasses grow; soil residues are minimum). The product prepared in the laboratory has been tested by a number of agricultural research institutes and industries, and has been found effective in controlling parthenium and other weeds in grazing, irrigated and agricultural fields where crops such as sugarcane, maize, wheat, jowar and rice are cultivated.

The herbicide, with a particle size distribution of 150-200 US mesh, has a pH of 2.9 ± 0.1 and bulk density of 0.8 ± 0.1 g/cc. Its main constituents are: cellulosic material, $11 \pm 1\%$; soapstone, $80 \pm 1\%$; urea, $1.8 \pm 0.1\%$; and 2,4-D, $7.0 \pm 0.3\%$.

2,4-D, lime, sawdust, soapstone, urea, nitrogen, thionyl chloride and dimethylformamide are the major raw materials required for the manufacture of the herbicide formulation. All these raw materials (technical grade) except dimethylformamide, which will have to be imported for the time being, are indigenously available.

The various items of plant and equipment required for the production of the herbicide formulation are: reactor (MS and GL), ribbon blender (MS), dosing tanks, storage tanks, hoppers, agitating vessels, heat exchangers, blowers, hot water circulator, vacuum pump, pulverizers, pneumatic conveyors and fluidized dryer. All these are either indigenously available or can be fabricated locally.

The laboratory has suggested a plant with a capacity of 300 tonnes/annum of the technical product (2040 tonnes/annum of formulated product) as the optimum economic-size unit. The capital outlay for a plant of this size has been estimated at Rs 47 lakh (Rs 5 lakh on land and building, Rs 15 lakh on plant and equipment, and Rs 27 lakh as working capital). The ex-factory cost of

production for the formulated product works out at Rs 4.30/kg.

Further particulars regarding this process (NRDC Process No. 813-05-9) can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, New Delhi 110024. □

PATENTS FILED

319/Del/79: A quick setting lamp for cross bar support, L.M. Prasad & N.M. Raju—CMRS, Dhanbad.

411/Del/79: Synthesis of a new insecticide belonging to the synthetic pyrethroid group, R.B. Mitra, G.H. Kulkarni, Z. Muljiani & P.N. Khanna—NCL, Pune.

457/Del/79: Process for the preparation of NI-substituted aroyl/aralkaroyl-NZ (2-carboxy phenyl substituted) hydrazine derivatives, N. Bhanumathi, V.K. Rao, P.B. Sattur & G.S. Sidhu—RRL, Hyderabad.

459/Del/79: Anodic methoxylation of furan to 2,5-dimethoxyfuran, H.V.K. Udupa, V. Krishnan, A. Muthukumaran & N. Mahalingam—CECRI, Karaikudi.

476/Del/79: A process for the resolution of di-3,4-*trans*-2,2-disubstituted-3,4-diarylchroman, M. Salman, S. Ray, V.P. Kamboj & Nitya Anand—CDRI, Lucknow.

553/Del/79: A process for the preparation of manganous sulphate monohydrate from ferromanganese slag—S.C. Das, P.K. Sahoo & P.K. Rao—RRL, Bhubaneswar.

556/Del/79: Improvements in or relating to heat-resistant paint for steel structure, S.N. Guruviah & K.S. Rajagopalan—CECRI, Karaikudi.

557/Del/79: Improvements in or relating to the production of ammonium perchlorate, H.V.K. Udupa, K.C. Narasimhan, R. Palanisamy & P.U. John—CECRI, Karaikudi.

PERSONNEL NEWS

Appointments/Promotions

W.S. Khokle

Dr W.S. Khokle of the Central Electronics Engineering Research

Institute (CEERI), Pilani, has been promoted as Scientist F (3 Aug. 1979).

Dr Khokle (born 1 Sep. 1933, Bilaspur) received his B.E. degree in telecommunication engineering from the Government Engineering College, Jabalpur in 1955, and M.S.E.E. and Ph.D. degrees in electrical engineering from the University of Minnesota, Minneapolis (USA) in 1959 and 1962



respectively. During 1955-56, he worked on instrumentation as a research scholar at Government Engineering College, Jabalpur, and from 1957, he was a research assistant at the Atomic Energy Establishment, Bombay. He was teaching assistant and lecturer during 1960-62 at the University of Minnesota where he also conducted research on secondary electron emission. From 1962 to 1963 he worked on tunnel diodes at Bell Laboratories, Murray Hill, N.J. (USA).

Dr Khokle joined CEERI in 1964. Till 1975 he worked on microwave semiconductor devices such as varactor diodes, impatts and trapatts. Since 1975 he has also been working on silicon transistors. He has guided to completion several projects on semiconductor devices.

Dr Khokle has published about 40 papers, and some of his work has been referred to in books. A research guide, Dr Khokle has produced five Ph.Ds. At present, he is working on a UNDP-funded project concerned with advanced technology on semiconductor devices. The areas of his current interest are: high voltage power transistors, tuning diodes, ion implantation, and electron beam techniques.

Dr Khokle was a Government of India merit scholar from 1951 to 1960. He was one of the authors of the paper on paramagnetic amplifiers which won the best paper award of the Institution of Electronics and Telecommunication Engineers in 1976. He has visited several laboratories abroad under UNDP and NSF fellowships. □

R. Sahai

Dr Rajeshwar Sahai has been appointed Scientist E at the Central Electronics Engineering Research Institute, Pilani (1 March 1979).

Dr Sahai received his B.E. and M.E. degrees in electronics engineering from the Birla Institute of Technology and Science, Pilani, in 1963 and 1964 respectively, and Ph.D. in electrical engineering from the Carnegie Mellon University, Pittsburg, USA, in 1971.

Dr Sahai carried out, during 1966-71, investigations on the photoelectric and interface properties of a suitable heterojunction with a view to fabricating high efficiency polar cells. During 1971-73, he worked on the development of the first double heterojunction photocathode device based on the Ge/ZnSe/GaAs lattice matched system. He developed the vapour phase epitaxial growth technique to fabricate such a structure. He also carried out a detailed computer analysis of GaAs homojunction and heteroface solar cells and established that the cause for low power efficiency of experimental GaAs homojunction solar cells was the steep impurity profile in the Zn-diffused layer and high surface recombination losses. These investigations were carried out by him at the Electrical Engineering Department of the Carnegie Mellon University.

From 1973 to 1975 he worked as a co-principal investigator for the NVL's contract for the development of a double heterojunction photocathode device. He was the principal investigator for the NASA Langley's contract for the development of the graded bandgap $\text{Al}_x\text{Ga}_{1-x}\text{As}/\text{GaAs}$ solar cells during 1976-79. He was a member of technical staff in the Near-IR Devices Group and the Solar Electric Power Group, Science Center/Rockwell International Thousand Oaks, California, USA, from 1973 to 1979.

At CEERI, Dr Sahai is in charge of the Solar Cell Group, the Materials Growth Group and the Mask Making Facility.

Dr Sahai is member of IEEE and the International Solar Energy Society. □

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The following have been appointed at the Central Electronics Engineering Research Institute (CEERI), Pilani: Shri R.R. Samnol (Scientist C1, 15 May 1979); Shri D.C. Vinayakrao (Scientist C, 12 Feb. 1979); Shri R.P. Aggarwal (Scientist C, 13 March 1979); Dr U.S. Tandon (Scientist B, 11 Oct. 1979); and Shri R. Nagarajan (Cost Accounts Officer, 6 Aug. 1979).

* * *

Appointments on promotion at CEERI include those of Shri M.V. Subba Rao (Scientist E1, 13 Nov. 1979); Shri H.N. Bandopadhyay (Scientist C, 25 Jan. 1979); Shri S.M. Sharma (Scientist C, 27 April 1979); Shri N.K.L. Raja (Scientist B, 17 Sept. 1979); Shri V.L. Patil (Scientist B, 17 Sept. 1979); Shri R.S. Raju (Scientist B, 17 Sep. 1979); Miss Prem Nagpal (Scientist B, 17 Sep. 1979); Shri Rahul Verma (Scientist B, 17 Sep. 1979); and Shri V. Srivastava (Scientist B, 13 Nov. 1979).

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Dr D.C. Goswami of the Publications & Information Directorate, New Delhi, has been appointed as Scientist C in the Planning Division at CSIR Headquarters, New Delhi (30 Nov. 1979).

Resignations

Dr A.V. Pendharkar, Scientist B, National Environmental Engineering Research Institute (NEERI), Nagpur, has resigned (3 Oct. 1979).

Transfers

Shri N.G. Parmar, Section Officer, has joined NEERI on transfer from the Regional Research Laboratory, Bhubaneswar (24 Oct. 1979). □

SEMINAR ANNOUNCEMENT

Technology Transfer in Leather and Leather Products in the ESCAP Region

The Central Leather Research Institute (CLRI), Madras, is organizing a

seminar on Technology Transfer in Leather and Leather Products in the ESCAP Region in collaboration with the Economic and Social Commission for Asia and Pacific (ESCAP). The seminar will be held from 31 January to 2 February 1980. The objectives of the seminar are:

(1) To assess the present status of leather and allied industries in the ESCAP region, with particular reference to the availability of (i) technologies required for the manufacture of leather, leather products, auxiliaries and machinery, (ii) facilities for research and development, (iii) training programmes and opportunities, (iv) extension services, (v) enforcement and practice of standardization, and (vi) identifying the areas offering scope for exchange of expertise and materials among the countries.

(2) To identify the problems in the development and modernization of leather and allied industries in the region.

(3) To identify the types of extension and consultancy services required for the effective transfer of technology to the various sectors of leather industry.

(4) To identify suitable training programmes at various levels for the development of the required skills.

(5) To develop effective technical and commercial information services to serve as links between technology and production systems and those that are useful to the researchers, technologists and entrepreneurs.

(6) To explore the possibility of forming a regional council for leather and leather products and other appropriate institutions to serve the needs of entrepreneurs by laying down policies for research and development and transfer of technology and by identifying common problems like disposal of effluents and better utilization of raw material potential and also arrange for exchange of technical expertise.

Further details regarding the seminar can be had from: The Director, Central Leather Research Institute, Adyar, Madras 600020. □



CSIR NEWS

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Public Health Engineers' Conference and National Workshop: NEERI

The All India Chief Public Health Engineers' Conference and a national workshop on 'R & D Needs during the Drinking Water Supply and Sanitation Decade: 1981-1990', were held at the National Environmental Engineering Research Institute (NEERI), Nagpur, from 18 to 22 November 1979. The workshop was co-sponsored by the World Health Organisation, the Central Public Health & Environmental Engineering Organisation (CPHEEO), New Delhi, and the National Environmental Engineering Research Institute, Nagpur. Seventy delegates including chief public health engineers, scientists, engineers and research

workers from national institutes of technology, engineering colleges, and consultants participated.

At the conference, the recommendations of the United Nations Water Conference held at Mar del Plata in 1977 to designate the decade 1981-90 as the 'International Drinking Water Supply & Sanitation Decade', were discussed. The U.N. conference had recommended a plan of action in four priority areas. It stressed the need to provide to all people with water of safe quality and adequate quantity and basic sanitary facilities by 1990. Underlining the need to accord greater priority to the poor and less privileged and to water-

scarce areas, the conference had recommended larger allocation of resources towards this goal in order to ensure general economic and social development.

In his opening address, Shri P.K. Chatterjee, Adviser, CPHEEO, Ministry of Works & Housing, Government of India, stated that about Rs 12,500 crore would be needed to meet the target of providing water of safe quality and basic sanitary facility by 1990 in India. Shri Chatterjee urged the chief engineers to submit data on the status of water and sanitation facilities in their respective states to enable the Government of India to bridge the gap and plan the material, manpower and financial requirements to meet the aspirations of the decade 1981-1990 in India.

Uptil now only 53,000 villages out of a total of 1,50,000 problem villages in India and 83% of the urban population have been covered with regard to water supply. In the sphere of sanitation and sewerage in rural areas, the facilities provided are very insignificant, he said.



Shri P.K. Chatterjee, Adviser, CPHEEO, delivering the opening address. Seated from right are: Shri D.V. Subrahmanyam, Regional Adviser, WHO SEARO; Shri S.T. Khare, Chief Engineer (Public Health), Maharashtra; Dr B.B. Sundaresan, Director, NEERI; and Dr John D. Skoda, UN/CEF Representative in India

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Shri D.V. Subrahmanyam, Regional Adviser, WHO South-East Asia Regional Office, New Delhi, said that the challenge of the decade was gigantic and could be effectively met only through better coordination — developed countries assisting the developing. This effort would help fulfil the basic needs of the people, especially of the rural sector.

Elaborating on the enormity of the problems, Shri Subrahmanyam said that of the total world population of 4000 million, about 50% live in developing countries and of these, half live in South-East Asia. India accounted for two-thirds, or 640 million. He said that 50% of the urban population in India had been provided with piped water supply and only 20% of the rural population had access to relatively unpolluted water. With regard to sanitation, only 34% of the urban population had access to a sewerage system, whereas in the rural sector it was practically nil.

Shri Subrahmanyam said that India was among the 110 countries (out of 150 UN member countries) to have completed the 'rapid assessment' with regard to the present status of water and sanitation facilities. He said that the WHO was compiling a donor catalogue of member countries which would list the availability of expertise, financial institutions and nature of assistance available for the International Decade.

Dr John D. Skoda, UNICEF Representative in India, said that UNICEF would play an active role in fulfilling the target of the International Decade, in order to ensure better health to children through safe and sufficient water. Till 1978, UNICEF had provided assistance worth Rs 75 million for development projects in India.

Shri S.T. Khare, Chief Engineer (Public Health), Maharashtra, and chairman of the conference, urged the chief engineers of all the states to identify all the other areas which would be unattended during the decade.

Prof. S. Subba Rao, Professor of Sanitary Engineering, All India

Institute of Hygiene & Public Health, Calcutta, was chairman of the workshop.

The proceedings and recommendations of the conference will be submitted to the Government of India for initiating a detailed plan of action at the national level for the decade 1981-90. □

NEERI Assists Maharashtra Village Water Supply System

A slow sand filtration demonstration plant was inaugurated at Burujwada, 29 km from Nagpur, on 20 November 1979.

Speaking on the occasion, Dr John D. Skoda, UNICEF Representative in India, who inaugurated the plant, congratulated the National Environmental Engineering Research Institute (NEERI), Nagpur, for extending the fruits of research and development to the people of Burujwada, a rural hamlet with a population of 700. Dr Skoda also praised the people for their pioneering effort of self help by contributing part of the construction cost from their own meagre resources and for undertaking the operation and maintenance of the treatment plant.

Dr B.B. Sundaresan, Director, NEERI, thanked the Maharashtra

Government for meeting the bulk cost of construction, which is about Rs 2.43 lakh (90%). He also thanked the WHO International Reference Centre for Community Water Supply, The Hague, for providing Rs 50,000 towards the project and the Nagpur Zilla Parishad for assisting NEERI.

Dr Sundaresan said that Burujwada was chosen because during a span of two to three years, 70% of the village population readily accepted the assistance from NEERI and participated in the rural sanitation programme. Under this programme, 1150 hand-flushed water-seal latrines were constructed in ten villages around Nagpur. The Nagpur Zilla Parishad is cooperating with NEERI in this programme. The sanitation programme in Burujwada is a 100 per cent success.

Maharashtra is the third state in India to receive the technical assistance of NEERI for the construction of a slow sand filtration plant, at Burujwada. The first demonstration plant was commissioned at Abu Shehar, a group of villages in Sirsa district of Haryana, in November 1978. The second plant was commissioned at Kamayagoundanpatti village, near Madurai (Tamil Nadu), in March 1979.

Under the rural sanitation programme of NEERI, the entire population of Burujwada has been provided



WHO International Reference Centre slow sand filtration demonstration plant at Burujwada

with hand-flushed water-seal latrines. Also, the village wells have been chlorinated with a view to improving the general health status of the rural population.

Shri R. Paramasivam, Scientist and Head, Engineering Division, NEERI, and Shri V.A. Mhaisalkar, Scientist, were deputed as experts by NEERI for implementation of the project. Shri P.V.R.C. Panicker, Scientist in charge, Epidemiology Cell, looks after the health education component and Shri S.R. Kshirsagar, Scientist and Head, Technology Demonstration Division, the rural sanitation aspects. □

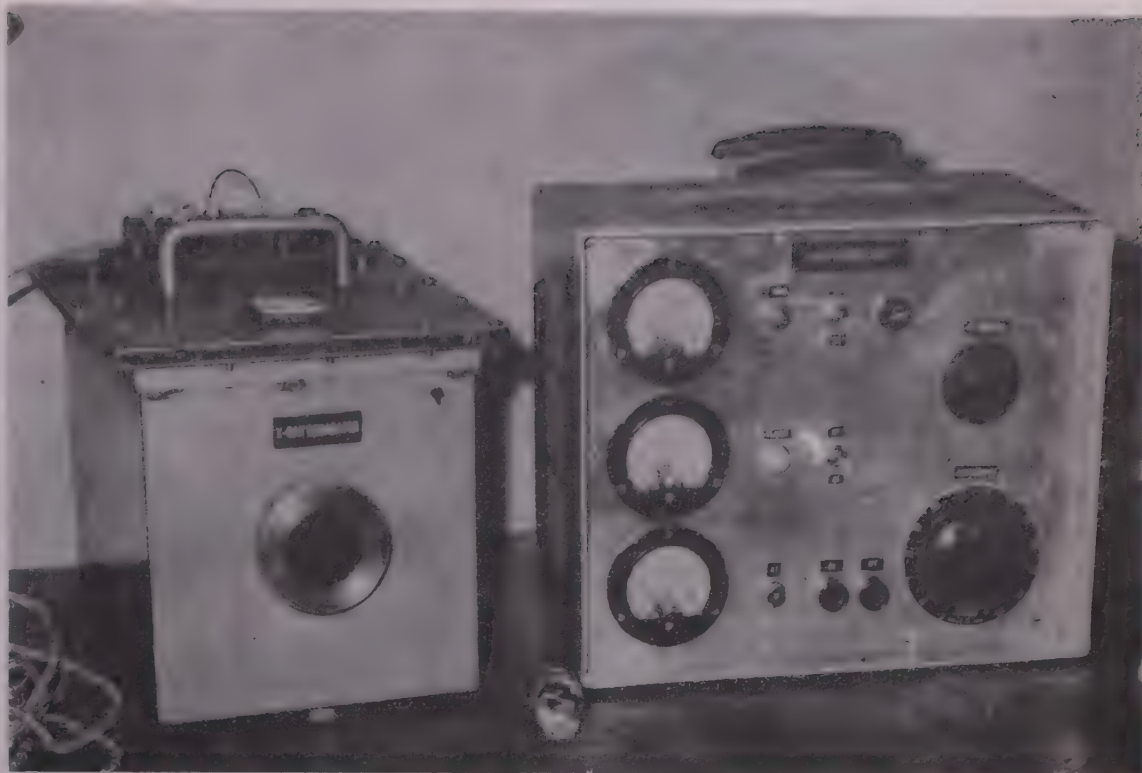
Portable X-Radiography Unit for Testing FRP Components

The National Aeronautical Laboratory (NAL), Bangalore, has designed and constructed a portable X-radiography unit for non-destructive testing of fibre reinforced plastic (FRP) structures of up to 40 mm thickness. The unit basically consists of a portable X-ray tube head and a control panel. The tube head comprises a step-up transformer and a BEL (Bharat Electronics Ltd) make X-ray tube (type DSA 1-85/15) working on self-rectifying mode. Since the unit works on grounded cathode principle, the filament transformer is housed in the control panel itself. The filament transformer is deliberately designed to have a high leakage reactance in order to have built-in short circuit current limiting property.

The specifications of the X-radiography unit developed by NAL are:

Input	: 230 V, 50 Hz, single phase
Output	: 0-60 kVP, 5 mA
Weight	: Tube head - 24 kg Control unit - 12 kg

The unit was used for locating teflon inserts in FRP sheets. The performance of the unit was found to be satisfactory. The cost of the unit is about Rs 10,000 (including overheads).



X-Radiography unit developed at NAL

The unit finds application in determining relative positions of reinforcements built into large FRP radomes, detecting inclusions and detecting flaws in FRP components, etc. □

Dehulling of Sesame Seeds

The Central Food Technological Research Institute (CFTRI), Mysore, has developed a wet dehulling process for easy removal of the husk from sesame seeds, thereby making it possible to obtain from them a good-quality oil and meal.

High-grade sesame oil can be obtained from dehulled seeds. The protein-rich cake flour is useful for enriching various food preparations.

Nearly 77% of an estimated annual production of 4,00,000 tonnes of sesame seeds in the country is used for oil extraction, and some quantity is used in a variety of sweets, confectionery and bakery products after removal of the fibrous husk. The seeds are required to be dehulled to remove the cuticle, which imparts a dark colour and bitterness to the product. The traditional practice of dehulling the seeds is by soaking the seeds overnight in water, followed by partial drying and rubbing against a

rough surface. This is laborious, time-consuming, and is suitable for handling only small quantities.

In the CFTRI process, the seeds are pre-cleaned in a machine and then chemically treated, washed and de-cuticled. The wet dehulled seeds are dried mechanically.

All the major equipment including units for precleaning, dehulling and destoning, and the drier are indigenously available. □

Improved Technique for Walnut Processing: CFTRI

Under its programme of development of technology for rural application, the Central Food Technological Research Institute (CFTRI), Mysore, has developed an improved technique for processing walnuts. The technique, which modernizes the time-consuming traditional process and improves the quality of walnuts, has been successfully tried by CFTRI during the last three seasons. The CFTRI technique can help boost the export of walnuts, which is around 8000 tonnes/annum, valued at Rs 30 million.

In the CFTRI process, freshly harvested green walnuts are first

conditioned to loosen the husk by being stacked in large wooden trays ($1 \times 2 \times 0.3$ m) with wooden grate bottom and covered with polyethylene sheets with punched holes for aeration, for 4-6 days. The trays, each of which can hold about 200 kg of walnuts, can be placed either outdoors or indoors.

The conditioned walnuts are mechanically dehulled in a machine powered by a 0.5 hp motor which can process 500-600 kg of green walnuts per hour with the help of a single operator for picking out hulls.

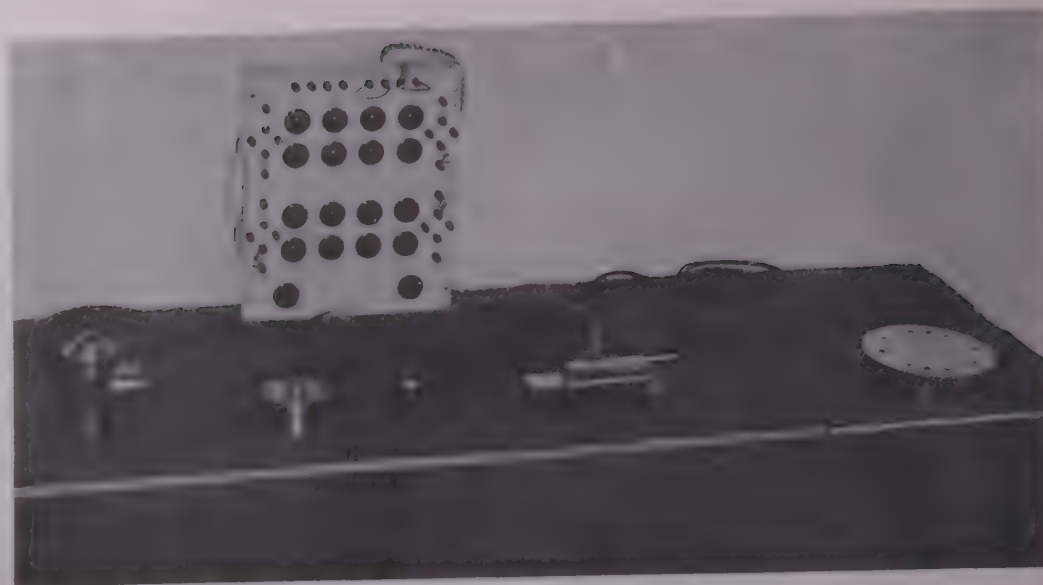
A manually operated washing machine and an electric powered washing machine have been developed and standardized for washing the dehulled walnuts. The dehulled nuts are then dried in a bin drier of capacity 500 kg/batch. With the air temperature maintained at $38-40^{\circ}\text{C}$, the drying time has been reduced from 7-8 days to about 3 days. A three-stage drier with brick construction has also been developed. A model plant for processing one tonne of green walnuts per day involves an initial investment of Rs 25,000 and a recurring expenditure of Rs 8000-10,000. □

SERC Develops Load Cells & Pressure Transducers

Load cells (tension and compression) and pressure transducers for various capacities have been developed by the Structural Engineering Research Centre (SERC), Roorkee.

Load cells and pressure transducers are electronic transducers which translate changes in force or pressure into electrical signals. These electrical signals are proportional to the applied force, which can be calibrated to give the required load or pressure. These units are hermetically sealed and have no moving parts. These have excellent repeatability and accuracy.

The unit developed at SERC has a sensing element on which strain gauges are fixed. On applying load/pressure the resistance of strain gauge changes in proportion to load/pressure and can be read by appropriate instrumentation.



Load cell developed by SERC, Roorkee

The Space Research Station, Thumba, evaluated the tension and compression load cells and rated these as the best available in the country. These cells compare well with the imported ones in performance.

These transducers find applications in rocket thrust measurement, process control testing of machines and weighing of crates in the harbours. With suitable instrumentation the load can be directly displayed in digital form.

A bridge balancing unit has also been developed which enhances the capability of a strain measuring bridge. Four independent transducers can be connected to each unit and a single measuring instrument may be used to monitor any number of transducers by connecting several such balancing units in series. □

Pepper Powder Production

The Central Food Technological Research Institute (CFTRI), Mysore, has prepared a project report on the establishment of a pepper powder processing unit for a public sector organization in Kerala.

India has been exporting pepper powder mostly to countries in West Asia; during 1977-78 44,500 kg of the powder valued at Rs 1.2 million were exported. The demand for pepper powder in the domestic and international markets is growing. The brands with assured and uniform

quality have special advantage in world markets.

A large share of the black pepper exported from the country is reported to be processed in the importing countries and sold to the ultimate consumer as pepper powder in unit packs.

The proposed pepper powder manufacturing unit will have an installed capacity of processing one tonne of black pepper per day. □

PROGRESS REPORTS NAL Annual Report: 1977-78

The National Aeronautical Laboratory (NAL), Bangalore, has published its annual report for 1977-78. The report (demy 4to, Pp 210) shows that the laboratory continued to carry out its R & D activities through its five divisions devoted to Aerodynamics, Propulsion, Structural sciences, Material science, and Systems engineering. The total financial inputs of the laboratory including contractual R & D amounted to Rs 36.354 million during the year and the total receipts, to Rs 8.606 million. Ninety-eight collaborative programmes involving a financial input of Rs 20.750 million were in progress. Of these, 29 were new projects undertaken on behalf of Aeronautics Research and Development Board (ARDB), Department of Space, Hindustan Aeronautics Ltd (HAL), Bharat Heavy Electricals Ltd (BHEL)

and other public and private undertakings. Work on 32 projects including three projects initiated during the year was completed.

The major thrust of the Aerodynamics Division was in the field of transonic flows. The 1.2 m trisonic wind tunnel continued to play a vital role in meeting the needs of the aerospace industry. Five hundred and sixty blowdowns were conducted during the year, bringing the total number of blowdowns conducted in the tunnel to 7134. Apart from the regular force and pressure tests, heat transfer studies on a rocket nose cone model, flow visualization studies of the effect of jet plume on the SLV-3 configuration and studies of trajectory of external stores released from an aircraft were the major tests carried out in the tunnel. These tests have resulted in the saving of considerable amount of foreign exchange.

A systematic study of aircraft configurations to generate design data was initiated. It included determination of the characteristics of basic configuration and the effect thereon of strakes and control surfaces. This work is of direct use to the aircraft industry.

The laboratory is developing a 10-m diam. sail windmill. A prototype has been developed which is designed to extract energy for pumping sufficient water to irrigate in windy places one hectare of wheat crop. With this design the rated power can be produced with wind speeds of as low as 3.5 m/s.

The Propulsion Division designed and built a low-grade heat recovery turbopack system using acetone as working medium to drive a conventional centrifugal pump. The system, designed keeping the cost factor in the forefront, is rated for a nominal output of 1 kW. If the waste heat is available in the form of hot water or steam continuously at a temperature of about 80°C, and assuming 80% availability in a year, the system can produce electric energy at a cost close to that of power from the thermal plants. The immediate application of such a system can be found in the utilization of waste heat

from industries, chemical plants and in the utilization of geothermal energy.

A finite element software for 3-dimensional stress analysis using isoparametric hexahedral solid element for the elastic and inelastic analysis was developed. The technique can be used for the analysis of general 3-dimensional structures and axisymmetric bodies such as those normally present in turbomachines like steam and gas turbines. The analysis accounts for pressure loads and temperature effects for a number of boundary conditions. The technique was successfully employed for 3-dimensional analysis of a typical high-pressure asymmetric turbine wheel subjected to thermal and mechanical loads.

The Materials Science Division successfully prepared boron nitride fibres for the first time in India. Boron nitride fibres are more high-temperature resistant than carbon fibres and are highly suitable for use in composites based on metal or ceramic matrices. The potential cost of these fibres is expected to be rather low, since the starting materials, boron trioxide and ammonia, are readily available. Tests carried out in the laboratory showed that a typical fibre after partial nitriding had a tensile strength of 80×10^3 psi.

Fatigue life evaluation of another aircraft was undertaken. The project is expected to identify fatigue critical areas and establish the safe operational life of the aircraft and also to evolve inspection and mod schedules for the effective maintenance and operation of aircraft in service. A new test rig with a load handling capacity of 5,00,000 lb for the fatigue testing facility was designed and was being fabricated. A control system was designed and a software for fatigue life evaluation of large fighter aircraft was developed. The system, undergoing operational trials with three actuator tail test facility, had already given more than 100 hr on-line computer performance.

The development of computer software reached a stage wherein the general purpose programme could be

employed for analysis of complicated flight structures. The package includes high precision shell and isoparametric 3-D elements. A special package 'SAPCOM' for analysis of rocket motor casings/pressure vessels, built out of laminated FRP, is also readily available for application. The computer software developed has an extensive structural modelling capability with a well packed element library, structural analysis capability which includes static analysis, and data processing capability for input data generation and output data manipulations.

The work on aeroelastic testing of launch vehicle models continued with particular attention being paid to accurate simulation of details. Additional models were designed and fabricated by incorporating all the modifications made in the prototype design. Static and dynamic tests were performed to examine the accuracy of inertial simulation and stiffness distributions. The servo-actuator parameters were also scaled down and incorporated in the model. Aeroelastic models for studying the effect of flexibility on static stability were designed, fabricated and ground tested.

A major investigation in the field of composite structures was that of laminated composite nose cones of missiles subjected to aerodynamic heating. The calculation of heat flux and boundary layer temperature arising from aerodynamic heating forms input data to the heat transfer analysis. Heat transfer and thermal stress analysis were carried out using finite element cum finite difference technique, the latter being applied over the time domain.

The Systems Engineering Division developed a process for the fabrication of foil resistance strain gauges on a bench scale using photo-lithographic technique. These strain gauges are superior in performance to the wire strain gauges developed earlier in the laboratory. The gauges developed so far were in the range of 3-5 mm gauge length having 120-1000 ohms resistance.

The division also designed and

developed a digital event recorder to capture short-duration events and to reproduce them when desired. The instrument features possibilities for automatic internal or external control of triggering and independent choice of recording and playback sample rating. The instrument is suitable in systems for monitoring and frequency analysis of shocks, transients and low frequency signals, and as a delay line.

A recent achievement of the laboratory is the development and fabrication of a 256-channel data logging system with complete signal conditioners for use by BHEL. The system is designed for the measurement of temperature, pressure, flow-level, ac-dc voltage and current, etc. The system, when installed at BHEL, will be the first

of its kind to be used in the country for the performance evaluation of a thermal power station.

The activities of the pilot plant facilities of the laboratory related to fabrication of fibre reinforced plastics, electrical transducers and associated instrumentation, and electronics and digital systems. The total receipts from the pilot plants during the year were Rs 2.151 million.

Forty-three research papers were published. Seventy-four papers were presented in symposia/conferences. Two patent applications were filed. Five processes were released to industry, bringing the total number of processes released so far to twenty-five, of which, nineteen have been utilized for commercial production. □

annum. The cost of equipment is estimated at Rs 8 lakh; working capital, Rs 10 lakh; and cost of production, Rs 8/piece.

Further particulars regarding this process (NRDC Process No 804-03-9) can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, New Delhi 110024. □

Monitor dc Defibrillator

The Central Scientific Instruments Organisation (CSIO), Chandigarh, has developed a monitor dc defibrillator, which is a combination of a cardiac monitor and a dc defibrillator. This device makes it possible to use a single set of pad electrodes for monitoring as well as defibrillation during cardiac emergencies caused by ventricular fibrillation. The instrument provides a quick monitoring of the heart function by picking up ECG signals from the patients' chest. The monitoring facility helps to isolate the abnormalities in ECG so that the defibrillating shock is applied to the patient only when he is suffering from the ventricular fibrillation and not otherwise. In addition, the monitor helps in confirming the effectiveness of the shock applied.

The defibrillator is designed to provide a maximum energy of 300 joules into 50 ohm load. The discharge time is designed to be about 6 ms. The equipment is portable and operates on rechargeable batteries. Along with the equipment, a separate battery charger, which operates in two modes—fast charging and trickle charging—is provided. A front panel lamp is provided to indicate the battery condition. Maximum safety precautions have been taken in the design of the instrument so that it can be safely operated by even inexperienced operators.

The instrument has the following specifications:

Maximum energy delivered into 50 ohms	: 300 joules
Maximum energy stored	: 400 joules

PROCESSES AND PRODUCTS READY FOR COMMERCIAL UTILIZATION

Silver Impregnated Graphite Contacts

The National Physical Laboratory (NPL), New Delhi, has developed silver impregnated graphite contacts using imported graphite. Silver impregnated graphite material possesses the requisite conducting properties of silver and the refractory properties of graphite. Silver cannot be used alone because it may be cold welded with the mating contacts, while graphite alone does not possess the required conductivity for heat dissipation. The impregnation of silver into graphite provides the ideal contacts for relay circuits where regular make and break is needed.

Silver impregnated graphite is used as contact material in signalling and electromagnetic relays and also as a brush material in F.M.P. motors. The contacts, widely used by Indian Railways in signalling, are imported at present.

NPL has developed about 1000 contacts, which have been tested by the Research Designs and Standards Organisation, Lucknow, and Westinghouse Saxby Farmers Ltd,

Calcutta, and have been found satisfactory. These contacts conform to IRS and BRS specifications.

The demand for such contacts is increasing with the introduction of more and more modern signalling techniques. The present import of such relay contacts is worth about Rs 30 lakh.

The raw materials required are: high purity graphite, impregnant chemicals, and coating/plating material. Except graphite all are available indigenously.

Lathe, milling machine, drying ovens, impregnation unit, furnaces, coating unit, spray units with compressors, generating set balances and soxhlet apparatus are the required equipment. All are available indigenously. The impregnation apparatus can be fabricated in the workshop; its components are available indigenously.

The following test instruments are also required: micrograph, electrical resistivity meter, hardness (VPN) meter, porosity meter, compressive strength meter, chemical analyzers, functional tester, and contact resistance meter. All are available indigenously.

The capacity of an economic unit is five lakh pieces of the contacts per

Output circuit	: floating
Defibrillating pulse	: about 6 ms pulse width
Charge time	: < 10 s for 400 joules with freshly charged batteries
Number of 400 joule shocks per charge	: 30
ECG amplifier bandwidth	: 1-30 Hz
ECG pick-up	: defibrillating (pad) electrodes
Scope time base	: 25 mm/s
Supply	: rechargeable Ni-Cd battery pack, 18 V nominal, 2 A-hr capacity
Monitoring time	: continuous 2 hr operation

A prototype was developed at the laboratory and the clinical trials conducted at the Postgraduate Institute of Medical Education and Research, Chandigarh, were successful.

The components required are: integrated circuits (ICs), transistors, diodes, capacitors, resistors, cathode ray tubes (CRT), HV relays, LV relays, panel mounting meters, ferrite cores, HCR torroidal core, HV capacitor, rechargeable Ni-Cd batteries, etc. ICs, CRT, HV, capacitors, and rechargeable batteries may have to be imported.

Since the instrument is assembly-oriented, no significant machinery for production is needed. Test equipment like oscilloscope, low frequency signal generator, power supplies, multimeters, ECG simulator, high voltage electrostatic voltmeter, defibrillator analyzer, etc. are needed for function checking.

For manufacturing 50 defibrillators per annum, a fixed capital on equipment of Rs 0.75 lakh and a working capital of Rs 2.00 lakh are needed.

The terms for the transfer of know-how are: lump-sum premium, Rs 6,000; recurring royalty, 3%; nature of licence, non-exclusive; and period of licence, 5 years.

Further particulars regarding this instrument (NRDC Process No.823-10-9) can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, New Delhi 110024. □

Digital Optical Density Meter

The Central Scientific Instruments Organisation (CSIO), Chandigarh, has developed a digital optical density meter. The instrument is needed for the measurement of optical transmittance and optical density in spectrophotometry. The instrument developed by CSIO is designed to accept electric signals from phototubes (or similar devices for converting optical signal to electrical signal). The signal is amplified and is measured against any one of the two scales corresponding to the optical density and the percentage transmittance. A function selector switch selects the scale of display. The instrument is provided with zero offset control to cancel out the phototube offset. When the input is beyond the dynamic range of measurement, it is indicated by means of suitable neon lamps. Applications for this instrument can be found in various fields involving chemical, physical and biomedical analysis.

The specifications of the instrument are:

Range of measurements

Density	: 0-2 (comparative)
% Transmission	: 0-100
Display	: 3½ digit nixie.

The raw materials/components required are: integrated circuits (ICs), transistors, diodes, capacitors, resistors, transformers, nixie tubes, switches and other hardware items. All are available indigenously except ICs which are of imported origin but are available indigenously.

As the instrument is assembly-oriented, production machinery is not significant. For testing, equipment like oscilloscopes, transistor tester, LCR bridge, power supplies and digital multimeter stabilizer are needed.

For manufacturing 100 meters per annum, the investments needed are: fixed capital (excluding land and building), Rs45,000; working capital, Rs50,000. An industry existing in a similar assembly-oriented line of manufacture will need considerably less

amount of fixed capital depending on the availability of equipment.

The terms for transfer of know-how are: lump sum premium, Rs5,000; recurring royalty, 2%; nature of licence, non-exclusive; and period of licence, 5 years.

Further particulars regarding this instrument (NRDC Process No. 827-10-9) can be had from: The Managing Director, National Research Development Corporation of India, 61 Ring Road, Lajpat Nagar III, New Delhi 110024. □

Non-cyanide Chemical Stripper for Removal of Defective Nickel and Copper Deposits from Iron/Steel Substrates

A certain percentage of plated articles is rejected in electroplating industry because of non-uniform plating. The rejects can be reprocessed by stripping the defective deposits and replating the stripped article under proper conditions. Stripping should be done carefully so that substrate is not damaged.

The Central Electrochemical Research Institute (CECRI), Karaikudi, has formulated a non-cyanide stripping additive mixture for removing defective electrodeposits by simple immersion of the rejects in a solution. This solution is suitable for removing nickel and copper electrodeposits on iron/steel.

The substrate obtained by employing the stripper needs no repolishing and can be taken straight through the plating sequence.

Indigenous demand for this product is at present met partly by locally produced material based on foreign know-how and its performance is reported to be not quite satisfactory. The estimated demand for the stripper is expected to be of the order of two lakh litres.

The capital investment for a plant of capacity 75 litres per day (of one shift) is Rs 27,500 and the cost of production

works out to Rs 48 per litre; the return on investment is expected to be 30%. □

Palatable Isapgol Granules

The Central Drug Research Institute (CDRI), Lucknow, has developed sweet palatable isapgol granules which can be used as a laxative. The estimated demand for these granules is 1000 tonnes. Presently, the raw husk is used in India as a bulk laxative. The finished products have great export potential, particularly in America, Europe, and Middle East countries. The export of raw isapgol seed husk in 1977-78 was valued at about Rs 20 crore.

In the CDRI process, the isapgol seed husk is freed from any foreign impurity, granulated through mixing with alcohol and gum acacia solution, and dried. The granulated mass is powdered to 40-60 mesh size. The sieved material is mixed with appropriate sweetening, flavouring agents. The product may or may not be mixed with other laxative agents and/or effervescent powder.

In the CDRI process, the isapgol seed husk is freed from any foreign impurity, granulated through mixing with alcohol and gum acacia solution, and dried. The granulated mass is powdered to 40-60 mesh size. The sieved material is mixed with appropriate sweetening, flavouring agents. The product may or may not be mixed with other laxative agents and/or effervescent powder.

The laboratory has produced the material in one kilogram batches of various flavours and forms; more than five kilogram of the product have been manufactured. The product has good consumer acceptability. The process is simple and can be easily scaled up to 100 kg batches or more.

The raw materials required are: Isapgol (*Plantago ovata*) seed husk, sugar, alcohol, gum acacia, flavouring agents, malt, etc.

All are available easily in the country. Isapgol is available in abundance in Gujarat and Rajasthan.

Stainless steel mixing pans, grinders,

vacuum driers (shelf/tray type), sieves, etc. are the equipment needed.

The suggested economically viable capacity range of the plant is 10-50 tonnes of the product per day. Fixed capital and working capital requirements would be Rs 1 crore and Rs 5 crore respectively. The return on investment is expected to be 40%. □

Further particulars regarding this process (NRDC Process No 817-09-9) can be had from: Managing Director, National Research Development Corporation of India, 61 Ring Road, New Delhi 110024. □

SYMPOSIUM ANNOUNCEMENT

New Frontiers in Polymer Science and Polymer Applications

An international symposium on New Frontiers in Polymer Science and Polymer Applications, sponsored by the International Union of Pure and Applied Chemistry (IUPAC), the Council of Scientific and Industrial Research, Indian National Science Academy, Sri Venkateswara University, University Grants Commission, Indian Petrochemicals Limited, the Royal Society (UK), Deutsche Forschung Gemeinschaft (West Germany), National Science Foundation (USA), United Nations Industrial Development Organisation and also a number of other organizations from Japan, Italy, Norway, Australia, and Belgium, is being organized by the Central Leather Research Institute (CLRI), Madras from 7 to 11 January 1980.

The main objective of the symposium is to discuss the present state and the future of polymer science and polymer applications. The symposium has been designed to cover all aspects in polymer science and technology which include engineering, thermoplastics, high modulus/high strength fibres, biomaterials, novel methods and processes, new polymers for elastomers, adhesives, surface coating materials, water soluble polymers, controlled release substrates and new developments in polymerization and characterization.

The programme will consist of about sixteen invited lectures and seventy contributed papers. A number of delegates from USA, UK, USSR, West Germany, Italy, Belgium, Australia, France, Norway, Japan and other countries will be participating. Sixty foreign delegates and about 150 Indian delegates are expected to take part in symposium.

The venue of the symposium would be Hotel Chola Sheraton, Madras. The conveners of the symposium are Prof. M. Santappa, Vice Chancellor, Sri Venkateswara University, and Dr N. Ramanathan, Acting Director, Central Leather Research Institute, Madras.

Further details regarding the symposium can be had from the organizing secretaries of the symposium, Dr K. Thomas Joseph or Dr K.S.V. Srinivasan, Scientists, Central Leather Research Institute, Adyar, Madras 600020. □

PATENTS FILED

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671/Del/79: Secondary heat exchanger to attain lower evaporator temperature in absorption refrigeration system, M. Prasad & P. Kumar—CMERI, Durgapur.

672/Del/79: Modified dividivi as a self-tanning material, K.K. Reddy, V.S. Rao, K.N.S. Sastry, T. Vijayaramayya, M. Santappa & Y. Nayudamma—CLRI, Madras.

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